Interventional radiology requires highly specialised knowledge and a very specific skill set. Because IR training in Europe differs greatly, this can lead to varying levels of expertise amongst practitioners, and sometimes makes it difficult to clearly define IR in relation to other specialties. Until 2013, there was a lack of European-wide guidelines which could ensure quality control and consistently high competency levels of IRs throughout the continent. It was then that the CIRSE Executive Committee decided to establish a task force to draw up the first European Curriculum and Syllabus for Interventional Radiology. Together with a number of experts, former Task Force Leader Anja-Maria Belli drew up a comprehensive 90-page document detailing the requirements that should be met by all aspiring interventional radiologists before going through summative assessment by means of the European Board of Interventional Radiology (EBIR). What came out was the IR curriculum: a document which describes the objectives, learning methods, outcomes, supervision and assessment of IR training and includes a syllabus describing the content of required knowledge and competencies to be covered with the aim of helping to standardise IR training and assessment across Europe. This was then used as the skeleton to develop the EBIR exam into the popular skill assessment the requirements that should be met by all aspiring interventional radiologists before going through summative assessment by means of the European Board of Interventional Radiology (EBIR).

In order to keep up to date with the ever increasing pace of developments in IR, the CIRSE Executive Committee felt that the European Curriculum and Syllabus needed to be revised accordingly and created a dedicated Task Force in 2016. We talked to Task Force Chairperson Raman Uberoi to find out more about the recently updated version.

CIRSE: Which areas in IR have changed the most and how did you adapt the syllabus accordingly?
Uberoi: IR is a rapidly evolving specialty and there is a greater desire and need to become a much more clinically focused specialty. Therefore, our most important goal when revising the syllabus was ensuring trainees would be more clinically involved in patient care. The syllabus not only has to reflect the most up-to-date techniques and technologies, but also clinical working practice, such as managing clinics, carrying out ward work and performing follow-up.

There has also been a massive increase in interventional oncologists managing cancer patients both for palliative and curative care. We also introduced new techniques, such as prostate embolisation, which has the potential to revolutionise the way in which we manage patients with benign prostatic disease.

CIRSE: Have any procedures become redundant?
Uberoi: Yes, some technologies’ popularity has decreased, which leads to treatments being performed less frequently. These changes have been reflected in the updated curriculum.

CIRSE: Do you feel the Curriculum has had an influence on how IR is taught and how IRs prepare for certification and exams such as the EBIR?
The main role of the EBIR curriculum is to ensure there are high-quality standards in the training and practice of IR throughout Europe. The curriculum forms the basis for the syllabus and the EBIR examination, which is increasingly being taken up throughout Europe with over 500 IRs having achieved this qualification. Together, the curriculum and EBIR examination are making IR training centres in Europe look very carefully at how they train IRs as well as how they assess competencies in IR following completion of their training programmes.

CIRSE: You are the Deputy Chairperson of the EBIR Council and, among many other tasks, share the responsibility for creating and editing examination material based on the curriculum and syllabus. Did your long-term experience with the EBIR examination help with the syllabus revision process?
Uberoi: Having been involved with the EBIR examination since 2011, I have learned a lot about exam theory and techniques, as well as the practicalities of administering the examination. This has allowed me to ensure that the curriculum not only outlines the skills trainees must have in order to be effective and safe IRs but also that both the curriculum and syllabus are much easier for trainees and examiners to use when preparing and planning for the EBIR examination.

For the updated European Curriculum and Syllabus for Interventional Radiology go to www.cirse.org/curriculum
Duplex-based aneurysm size measurements and changes over time obtained with ultrasound correlate well with those obtained with CT and can be considered equivalent to CT. Duplex has a high sensitivity in detecting endoleaks that require intervention. CEUS may detect more endoleaks than CT angiography with very good diagnostic performance, with additional advantages being the absence of the risk of inducing renal impairment, no radiation, and a lower cost compared to CTA. Ultrasound can be used as the sole imaging study in patients with an appropriate body habitus, without EVAR-related problems (as demonstrated on earlier contrast-enhanced CT examinations), or in patients with shrinking or stable aneurysms. CTA should be reserved for cases of inconclusive ultrasound, signs of complications and unfavourable anatomy. Use of duplex only will not lead to an increased occurrence of adverse events such as rupture, graft migration or limb occlusion, and can lead to a significant reduction of costs and radiation exposure related to EVAR follow-up. The prerequisite is that the examination is performed by experienced and accredited operators on state-of-the-art equipment. Non-enhanced CT provides diameter and volume measurements as accurately as enhanced CT, and it has been shown that volumetric analysis using non-enhanced CT with an increase in volume of 2% as a cut-off point can be used as a test for endoleaks. Only in cases where aneurysm growth is seen should additional contrast-enhanced CT be performed. In this way, a reduction in cost and radiation exposure (by 57–72%) can be achieved. It is known that low-flow endoleaks can only be detected during delayed post-inflammatory imaging in the presence of aneurysm sac enlargement. Therefore, screening for aneurysm growth and type I and III endoleaks may be sufficient. Plain abdominal radiographs have been used in the past, but clinical problems related to failure of the metallic support are very rare nowadays. CT scanners that provide high-resolution imaging can take over the role of plain radiography to evaluate structural integrity. Contrast-enhanced CT imaging has demonstrated adequate overlap of the modular parts of the stent-graft, the role of plain abdominal radiography has become very limited.

The surveillance modalities (historically) used are plain abdominal radiography, ultrasound (duplex or contrast-enhanced ultrasound – CELS), CT angiography and MR angiography. The optimal modality to use is the subject of ongoing debate and a lot of the discussion focuses on the need for different imaging modalities. The when and how of biodegradable biliary stents in a paediatric group: is it better than what is used currently. S. Dyer Hartnett, 1 J. Diez Miranda, C. Gonzalez-Junyent, G. Sempre Campbell, C. Parra-Fairias, M. Pérez Lafuente, A. Segarra Medrano, Barcelona/ES.

Follow-up after EVAR with newer generation stent grafts can be reduced significantly. Initial follow-up (during the first year after EVAR) should still include contrast-enhanced CT, and follow-up should focus on prevention of aneurysm rupture. Aneurysm rupture is mainly related to growth of aneurysm size, and the detection of endoleaks can be considered less important. It is more important to identify ‘growers’ and distinguish them from ‘non-growers’. This knowledge has led to the development of risk-adapted strategies. Simplified follow-up can be performed in cases of adequate sealing, good component overlap and the absence of endoleaks on 30-day post-operative imaging, in the presence of significant sac shrinkage. Standard follow-up should be performed in the presence of type II endoleak without sac growth, patients with non-shrinking sac. Finally, intensive follow-up is needed in patients with short sealing zones, and sac growth. Such an individualised follow-up after EVAR should therefore be the standard of care.
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Percutaneous treatment of cystic echinococcosis: current concepts

Okan Akhan

Cystic echinococcosis (CE), traditionally known as hydatid disease, is caused by echinococcus granulose. CE is an endemic disease resulting in a significant public health problem in many parts of the world, such as the Mediterranean basin, Middle East, South America and some parts of Africa [1]. It is accepted to be a neglected disease by WHO as it is mainly a disease of rural areas of economically weak communities of the world. Clinical diagnosis is difficult as most patients have vague clinical findings. Although some serological tests are traditionally used for the diagnosis, the results seem unsuccessful in confirming the existence of the active disease or excluding the presence of the disease [1-3].

Imaging

The diagnosis of liver CE is mainly based on imaging modalities. Ultrasonography is the most important imaging modality, not only for diagnosis, but also for the classification of liver CE. MRI with MRCP can also be a good option for diagnosis and classification as well as searching for possible communication between liver CE and the biliary system. Although there are more than 20 classifications in the literature, the most widely used are the Gharbi Classification and the WHO classification. WHO classification is the preferred one as it reflects the natural history of the cysts better and gives us a chance to make a differential diagnosis between the active and inactive types [1,4].

Management options

A stage-specific approach is needed to choose the proper treatment method, as there is a close relation between the types of the liver CE according to classifications and possible treatment options. In the treatment of liver CE, there are four management options: medical treatment, surgery, percutaneous treatment and wait-and-watch approach [4,5].

The results of "medical treatment" with Albendazole were disappointing, based on the results from the last four decades and "medical treatment only" does not appear to be a viable option as the patients are given medical treatment before or after percutaneous treatment as well as surgery [6]. Surgery is the conventional treatment for liver CE. However, surgery is associated with high rates of mortality, morbidity, recurrence and longer hospital stay. The morbidity and mortality rates of surgery range between 12.3%-80% and 0%-6.3%, respectively. Hospital stay after the procedure is also highly-variable, with an average of 14 days for non-complicated cases and up to 30 days for complicated cases. Recurrence rates during follow-up also vary among the published series, depending on different parameters used, with a reported rate of 6.3% in the meta-analysis published in 2002 [7-10].

Indications for percutaneous treatment

Imaging findings are the main indicators for maintaining the treatment plan of hydatid liver cysts. A stage-specific approach is also valid for the percutaneous techniques if CE is alive, as there is a direct relation between the types of the liver CE according to classifications and the percutaneous techniques employed, such as PAIR, standard catheterisation or MoCaT (modified catheterisation technique). Therefore, there is no "one-size-fits-all" approach in liver CE. Based on the WHO classification, PAIR or the standard catheterisation technique is employed. CE2 and 3b lesions are treated by the PAIR procedure, the standard catheterisation or MoCaT technique [11,14].

The PAIR technique

First described by Ben-Amor et al. in 1996, PAIR is an abbreviation which stands for CE 1 and 3a cysts, while MoCaT is used for CE2 and 3b lesions.

Patients with CE 4 and CE 5 should be examined by ultrasonography once a year. This management approach is defined as "wait and watch approach" as no active intervention is indicated in these patients. For liver CE, which is perforated into the biliary system, peritoneum or pleura, surgery is the best treatment approach [1,4,5].

What happens after percutaneous treatment?

An experimental animal study in sheep revealed macroscopic and microscopic findings which were compatible with the findings demonstrated on follow-up US examinations. In this study, healing criteria were defined as reduction in size and volume of the cyst with thickening and irregularity of the cyst wall progressing to the gradual solidification and finally, a pseudo-tumour appearance [11].

Techniques

Three main techniques were described in the percutaneous treatment of hepatic hydatid cysts. The PAIR technique is preferred for CE1 and 3a. If cysto-biliary communication or any technical problem develops during the PAIR procedure, the standard catheterisation technique is employed. CE2 and CE 3b, according to WHO classification, are treated by the MoCaT technique [11,14].

Fig. 1: CE 1 according to WHO classification with double-contour sign were detected on an abdominal CT and US examination of 10-year-old female patient. (a-b) Percutaneous treatment was performed using PAIR (c-f), 2 year follow-up ultrasound showed a “pseudo-tumour appearance” representing a dead remnant (g).
Effective irrigation of the cavity, performed for evacuation of the content, was achieved through catheter placement to reduce biliary pressure. The cavity was rigorously cleansed with isotonic saline (0.9% NaCl) and alcohol for effective and aggressive irrigation. Before the withdrawal of the catheter, the reported mortality rate of hospital stay is about 0.05%. Dissemination of the cyst content to the abdomen after percutaneous treatment was not reported in the patient cohorts. Among the major complications are: superinfection of the cyst cavity, obliteration of communication and severe anaphylactic reaction. The overall reported rate of major complications is about 10%. Minor complications such as urticaria, severe itching and hypotension can easily be managed. Some patients may develop fever, not exceeding 38°C, after the procedure; this is mostly self-limiting and does not require any medication. The reported time period for hospital stay is between 2.5-4.2 days [14, 16-24].

**Conclusions**

Percutaneous treatment of liver CE is an effective and safe approach with successful results, as it is associated with lower complication and recurrence rates and shorter hospital stay. Based on the scientific data and evidence, the percutaneous approach should be considered as the first treatment option for active liver CE.

The percutaneous approach is very effective in the treatment of extra-hepatic CE lesions located in other parts of the abdomen and elsewhere in the body such as kidney, spleen, peritoneum, adrenal gland, soft tissue, parotid gland or orbit [14, 25-30]. However, surgery is indicated for the treatment of CE lesions located in lungs and CNS [31, 32].

**References**

20. Schlegel HG, Landolt H, Gugliotta C. Echinococcosis of multicystic liver cysts with or without cystic biliary fistulae which contain non-dissolvable material. First results of a modified NPI method. Gut 2003;51:719-723

**Fig. 2:** CE2 cyst was detected on abdominal US (a) and CT (b) examination of the 30-year-old male patient. Percutaneous treatment was performed by MoCaT technique. A 18-G Seldinger needle under US guidance (c). Contrast media was injected with an 18-G Seldinger needle under US guidance (d). A 0.035-inch Amplatz guide wire was advanced under the fluoroscopy guidance (e). After tract dilatation, an 18-G catheter was advanced over the guide wire and placed within the cavity. (f). “Effective and aggressive irrigation of the cavity”, was performed for evacuation of the content. Cysto-biliary fistula was detected 3 days after the procedure (g). The patient was referred to the gastroenterology and endoscopic papillotomy and naso-biliary catheter placement were performed to reduce biliary pressure (h). Cysto-biliary fistula was healed and the cavity totally collapsed 14 days after endoscopic procedure (i). Amount of daily drainage dropped below 10 mL and the catheter was withdrawn. Complete resolution of the cyst was seen on follow-up (36 months after percutaneous treatment) MR (j) and US (k).

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**Cardiovascular and Interventional Radiological Society of Europe**
A Brief History of IR in Denmark

Poul Erik Andersen, EBR

The history of Danish interventional radiology goes back to 1932, in Aarhus, where the first even vascular angiographies were performed by a neurologist who injected radioactive thorotrast contrast through a carotid arteriogram.

Later in 1948, the first documented lower extremity angiography was performed in Odense. Early examinations were performed with a puncture of both femoral arteries. The patients, under general anaesthesia, lay on the floor to get sufficient film-focus distance, and two doctors were on their knees beside the patients.

The Seldding puncture technique was then introduced in 1955. Our early angiography catheters were homemade from a roll of plastic tube which was cut to an appropriate length and stretched out until the diameter was suitable for the guidewire. Side holes could also be added and the catheter was sterilized overnight. The examination took hours and received much attention from the whole department. The cassette film changers were prototypes made individually at each hospital. They usually had a capacity of five exposures per ten seconds.

From the late seventies to the early nineties, Denmark saw the introduction of PTA, TIPS, UFE and coronary stents amongst other ground breaking IR procedures. Danish IR has been ahead of Europe in many respects. Over the years, increasing centralisation and standardisation of these procedures is intended to increase the volume of patients per centre and, as a result of this, also increase the expertise and improve results (Fig. 1).

The Danish IR Community

The Danish Society of Interventional Radiology (DIRF) was established in 1996 with about 15 members. The society is the main pillar in IR education in Denmark, they organise two-day long annual, scientific and educational meetings with up to 90 attendees. These have been arranged during the last 15 years with participation of international and local IR experts. We have an educational programme for IR and a Danish syllabus translated from the CIRSE syllabus but there is no official sub-specialisation of IR in Denmark. There are now about 80 members of DIRF, of which six are EBR holders and four are CIRSE fellows. The engagement in DIRF has risen gradually over the years, with DIRF becoming a group member of CIRSE in 2007. We have had and still have members who serve on the Executive Committee, Scientific Programme Committee, Rules Committee, Membership Committee, and are also members of the EBR Council and examinations Board and are involved in the Vascular Division of the Foundation Advisory Council.

Denmark was the local host for an ESIR embolisation course in Odense and for CIRSE 2008 in Copenhagen. We have active members in CIRSE and ECR who act as congress organisers, programme planners, faculty members, lecture presenters and moderators and have led a session as part of the Students’ Programme. We have many members of DIRF who are reviewers for CVR and who have published several international peer-reviewed articles.

IR in Denmark Today

Denmark is a small country with about 5.7 million inhabitants. The four university hospitals in Denmark provide high quality tertiary patient care, performing all kinds of vascular and non-vascular interventions. IR in general is increasing rapidly in Denmark (Fig. 2). The hot interventional topics in Denmark are similar to the rest of Europe.

Here are six recent studies in IR from Denmark:
1. Graft limb complications in endovascular aortic repair

Advanced endovascular treatment of abdominal and thoracic aortic aneurysms and endovascular symptomatic/ruptured abdominal aortic aneurysms (eVAR, eVARu) and branched grafts [2-7]

2. The systemic inflammation response following endovascular aortic aneurysm repair
Ph.D thesis, University of Copenhagen, 2013 [8,9]

Complications at Femoral Access Sites in Cardiac Percutaneous Procedures

3. Uterine fibroid embolisation - Long-term follow-up and technical perspectives

4. Spinal embolisation - Preoperative embolisation in surgical treatment of metastatic spinal cord compression
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J. Van Den Berg

Vessel prep technology: When DCB alone is not enough
P. Krishnan

Prolong dialysis access with combination of IN.PACT™ DCB and Fortrex™ HP Balloon
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Saturday 16 September, 14:00
M. Treitl

Tuesday 19 September, 12:45
Hands-on atherectomy training

Monday 18 September, 12:45
Extending the life of dialysis AV access: lessons learned in using DCBs
K. Katsanos
How can a radiological intervention be “amazing”? When you look at the cases from the Amazing Sessions sessions over the last three years (accessible on CIRSE’s educational platform, ESIRonline), you will find many outstanding IR cases presented by outstanding interventional radiologists from all over the world. The cases deal with lots of different aspects of interventional radiology: from head to toe. You will find, for example, exceptional cases of aortic aneurism repair, extremely difficult peripheral vascular cases and many exceptional interventional oncology cases, showing that almost everything is possible in the different fields of IR. Looking at these case presentations might change your daily practice because you see different and, in many cases, very creative, even crazy, ways of dealing with different problems.

When I checked my case database to select an exceptional case for the Amazing Interventions session at CIRSE 2017, I found some very difficult, very nice cases which would have been great to show. Nevertheless, I asked myself what cases were outstanding, and which were the ones that made me really love my job as an IR?

In “my” amazing cases I was the leading IR, part of a large interdisciplinary team dealing with unexpected and very difficult situations, in which we rescued patient’s lives.

One of these patients was a 22-year-old male patient coming to the hospital by cab from a nearby subway station. He had been involved in a shooting and had a small wound near the left nipple. CT-angiography showed a huge hole in the aorta, which showed a small “tail” in the direction of the left ventricle. The patient left hospital in an excellent clinical condition two weeks later.

The second patient was a 39-year-old female patient with Marfan’s syndrome; she was pregnant in the 24th gestational week and was transferred to our hospital with life-threatening symptoms of mesenteric ischemia. Emergency CT-angiography showed an acute aortic dissection with signs of a pneumatisis and necrotic parts of the intestine (Fig. 1d). Our interdisciplinary team decided to try a three-step procedure in the angio suite as a first step, successfully implanted a thoracic stent graft to stabilise the aortic dissection, as a second step, the gynaecologists rescued the baby by caesarean section; in the third step, the abdominal surgeons resected the necrotic parts of the intestine. Baby and mother did well and both survived this life-threatening condition.

In these spectacular and demanding cases, excellent interdisciplinary work is crucial in order to finish them successfully. What is fascinating again and again for me is how perfectly medical doctors from so many different disciplines, as well as nursing staff, work together. Every single person in the angio suite (and there are many in these extreme cases) knows what to do without having to exchange many words. Depending on the problem of the patient, interventional radiologists often have the lead and have to coordinate many people. What is very important for interventional radiology, in my opinion, is to actively offer problem solutions for different medical conditions. In the acute setting, it is important to be present at the CT machine or in the trauma unit and to present solutions to the surgeons, emergency doctors and other colleagues. What makes us different to other clinical disciplines is that we are highly competent in imaging disciplines, and it is of utmost importance to keep this competence. When we are the first at the CT/MR machine, we will always be the first who can actively offer our excellent and minimal invasive methods to our clinical partners.
New CVIR Editor-in-Chief Gets Started

Mia Ilic, CVIR Editorial Office

On September 1, 2017, Prof. Klaus Hausegger, took over the Editorial Office of CVIR’s official journal Cardiovascular and Interventional Radiology (CVIR) from Prof. Dierk Vorwerk, who did a fantastic job in leading the journal since 2003. Prof. Hausegger will start his term of office with a new Editorial Board, a group of leading IIR experts from all over the world. Together they will make sure the journal continues to thrive, keeping up with the good work of Prof. Vorwerk.

Prof. Hausegger believes a peer-reviewed medical journal like CVIR has an important role to play. In today’s world, information has become easy to produce and access. CVIR ensures that only scientifically valid medical information, which is approved by experts, gets published.

As the journal’s Editor-in-Chief, his goal is to continue publishing cutting-edge research in the field of interventional radiology and related disciplines. During his tenure, he will strive to offer the readership and authors an excellent service. Additionally, he will not only ensure that high-quality science gets published but that published content gets properly advertised. However, we shall not forget that good publishing is not chasing a high journal impact factor by publishing exceptionally prominent information. Prof. Hausegger stated in his introductory editorial piece that “Good science includes dealing with down-to-earth, everyday problems, practical issues and education, which may not be immediately addressed in highly cited scientific articles but rather through review articles and editorials. These types of manuscripts will continue to find their well-deserved place in CVIR”.

This year, as in the past, CVIR will award four distinctions during CIRSE 2017 for Outstanding Service to the Journal. We are proud to present this year’s awardees:

- Most downloaded article: Jim A. Reekers, “The Role of Interventional Radiology in the Treatment of Arterial Diabetic Foot Disease”
- Most cited article: Kevin F. Seals et al., “Radiation-Induced Cataractogenesis: A Critical Literature Review for the Interventional Radiologist”
- Best media performance: Hamed Asadi et al., “Endovascular Therapy Research in Lower Limb Peripheral Arterial Disease Published Over a 5 Year Period: Who is Publishing and Where?”

In appreciation of the reviewer’s crucial services, we are glad to announce that Dr. Naito Akiro will receive the award for carrying out the largest amount of reviews in 2016. The reviewer’s contribution is a necessary factor in editing and publishing a proficient scientific journal. We would like to thank all of our reviewers and hope that they will continue to support our journal.

In the future, CVIR will not only focus on science but also on education. In 2018, the journal plans to provide its readers with the possibility of acquiring CME credits by working on certain manuscripts; hereby linking the journal to the European Board of Radiology (EBIR).

As the Editor-in-Chief, Prof. Hausegger will take on his new role with the help of his editorial team, made up of experienced interventional radiologists, in their roles as Deputy Editor-in-Chief, Section Editors, Regional Editors, and Editor for Public Affairs. Four Section Editors will represent the following sections: Vascular, Non-vascular, Oncological Interventions and Embolisation. Each section will be supported by the expertise of a group of distinguished experts in the field as members of the Editorial Board.

CVIR should be the voice of interventional radiology in Europe and beyond.

Klaus Hausegger, New CVIR Editor-in-Chief

IDEAS Training Village – Get hands-on with the latest aortic devices!

This year’s Aortic Symposium will feature another edition of the IDEAS Training Village running from Sept. 17-19, next to Auditorium II. First established at CIRSE 2016, the interactive platform was met with great interest, as it allows industry partners to present their devices in an interactive workshop format while providing physicians with hands-on learning.

All workshops are free of charge; you can still sign up at the registration counters in the entry hall.

**Getinge**
- **Sunday, September 17** | 08:30 – 12:30
- **Monday, September 18** | 08:30 – 12:30 (this is a repeated workshop)

Getinge will be offering two hands-on workshops entitled “The chimney endovascular technique in the treatment of juxtaaortic aneurysms: from alpha to omega for 25-30 participants”. After an introduction covering pre-operative planning, the step-by-step procedure and tips to optimise clinical outcome, there will be a simulation of the technique in the silicon model, followed by the opportunity to ask questions and discuss the procedure with the presenting experts. Delegates who wish to participate in this workshop are requested to register in advance at the entrance to the Training Village.

**Bolton Medical**
- **Sunday, September 17** | 14:00 – 18:00

In Bolton Medical’s workshop, participants will learn to use Orix from scratch, starting with the database page and importing images. The workshop will further explore how to export a series as well as anonymisation main commands, toolbars and customisation ROIs and many more.

Participants will have the chance to try technical analysis and measurement hands-on, including orthogonal MPR, oblique (3D) MPR, diameter and lengths, the use of MPR to calculate angles, volume rendering and the export of images.

**Endologie Technical Forum**
- **Monday, September 18** | 14:30 – 16:00

Deeply committed to solving the most challenging problems in aortic therapy, Endologie offers an unmatched portfolio of three unique, ground-breaking technologies enabling physicians to provide personalised AAA care for each patient. This workshop will specifically focus on the polymer-based technologies, Nellix and Ovation. Dr. Pulpeiro from Spain will share his individual experience including patient selection criteria, technique, curve and key tips and tricks for optimised and durable outcomes with EVAR and EVAS. The workshop is designed to be a very interactive and practical session, combining a clinical data update presentation and a flow model deployment to guide you through a step-by-step deployment of both technologies.

**The CHEVAR with the Endurant®* Stent Graft System**
- **Monday, September 18** | 13:30 – 15:30

Polymer sealing for AAA: why we need to consider an alternative to traditional EVAR

**Medtronic**
- **Tuesday, September 19** | 09:00-11:30

The CHEVAR with the Endurant®* Stent Graft System workshop will be an interactive session allowing participants to gain a deeper insight into the CE-approved indications and procedural steps of performing a CHEVAR procedure with the Endurant®* stent graft system. The facilitators will use case and video presentations, as well as an aortic model to demonstrate the technique and convey the corresponding knowledge. After a short introduction, inclusion and exclusion criteria will be discussed, followed by OR set-up and materials. The two presenters will then give tips to optimise clinical outcome, followed by an interactive final discussion of the topic.

**Phoenix Hybrid Atherectomy System – The next generation of peripheral atherectomy**
- **Tuesday, September 19** | 15:00-16:00

The second workshop will let participants gain practical experience with the Philips Volcano Phoenix Atherectomy System for PAD, allowing them to become familiar with IVUS imaging in plaque morphology evaluation and improve their technical and procedural expertise (IVUS + Phoenix). After a brief discussion of plaque morphology and lesion evaluation, there will be a technical overview of the system, followed by treatment guidance. Participants will then have the possibility to gain some hands-on experience at preparing and operating the system. To conclude the workshop, several case examples will be discussed.

*Disclaimer: All procedures will be followed by a live export of images.
CIRSE Joins ECCO

Helen Hemblade, CIRSE Office

CIRSE is proud to announce that it is now a member of one of Europe’s most respected oncology federations, the European CanCer Organisation.

At the end of 2016, CIRSE became a member of the European CanCer Organisation (ECCO), a 35-year-old, not-for-profit oncology federation, which comprises 25 member organisations. Representing 170,000 professionals, ECCO promotes interdisciplinary cancer care through education, training and scientific meetings, all while encouraging interaction between European organisations involved in cancer treatment.

A Driving Force in Oncology

The idea of ECCO was first conceptualised in the early 1980s by a few European experts who envisioned the future of cancer care as a coordinated approach encompassing all medical disciplines. Later, six medical oncology societies (ESMO, ESTRO, ESSO, EACR, EONS and SIOPE) consolidated these efforts into the Federation of European Cancer Societies (FECS), and, in 2007, the organisation officially became the European CanCer Organisation. It has since been very active in attempting to improve cancer patient outcomes through multidisciplinary collaboration and is now considered the unified voice of European cancer professionals when addressing common policy issues.

Beating Cancer Together

In order to stimulate its growth and impact on a global scale, intervention onology needs to continue establishing its role through collaboration with other disciplines in the field of oncology. To encourage multidisciplinary teamwork, CIRSE created the Collaborating Against Cancer Initiative, a travel grant which allows delegates to bring along any non-radiologist colleague free of charge to our European Conference on Interventional Oncology (ECIO). The result of this is that physicians from other disciplines, such as oncologists, hepatologists, surgeons and radiation therapists have the rare opportunity to learn about interventional oncology through our thematic sessions, multidisciplinary tumour board discussions and hands-on device trainings. We are very much enjoyed seeing our non-radiologist colleagues in Bilbao at ECIO 2017!

The initiative to join up with ECCO was orchestrated by CIRSE’s Oncology Alliance Subcommittee (OAS), which was formed in 2012. The OAS strives to reaffirm the role of interventional oncology in cancer care through collaborating with other oncologic organisations, improving data, and consolidating a curriculum for education and training in interventional oncology. Another of their recent achievements was the publication of an interventional oncology entry for Wikipedia, the free online encyclopaedia. The aim of this was primarily to inform the general public on the subspecialty as well as to bring it to the attention of other medical professionals. Now that CIRSE is a member of ECCO, the OAS hopes to develop on its efforts to inform patients about interventional oncology and further establish minimally invasive therapies as a part of cancer care.

To kick start our partnership with ECCO, CIRSE was represented in the Member’s Square at ECCO’s Annual Meeting in Amsterdam on January 27-30. In this space, CIRSE was able to display the ECIO Preliminary Programme and the CIRSE logo. In addition to this, Prof. Gangi and Prof. Pereira both attended the ECCO General Assembly on May 22 as the CIRSE Representative and Alternate Representative, respectively. Prof. Pereira has also attended two ECCO guideline writing meetings during the past year, both of which he found very useful. CIRSE and the OAS are honoured to be part of such a monumental organisation and look forward to a fruitful collaboration in the name of multidisciplinary cancer care.
Bone tumours and combined therapy: when and how?

Lambros Tsilkas, Thierry de Baere and Frédéric Deschamps

Bone tumour management depends on multiple parameters, including the benign or malignant nature of the tumour. The management of primary bone tumours versus bone metastasis is very different, but all aggressive or growing bone tumours can be responsible for skeletal related events (SREs) that significantly impair patients’ quality of life and survival [1].

An appropriate strategy requires a multidisciplinary discussion at a tumour board to define the endpoint(s) and the most appropriate treatment(s). The endpoints can be very different and can be associated with pain palliation, prevention of SRE or local tumour control for oligometastatic disease, or when tumour response to systemic therapies is dissociated [2,3,4,5].

Over the last couple of decades, technical developments in interventional radiology, orthopaedic surgery and radiation therapy have allowed for a more effective local management of these tumours and have increased the number of therapeutic tools available in addition to systemic therapies. These tools can be used alone or in association to provide synergic effect. Benign lesions and primary bone tumours rarely require combination therapies (except aggressive vertebral haemangiomata) [6].

Available armamentarium

Schematically, available techniques are classified as “anti-tumoural” and “consolidative”. The goal of anti-tumoural techniques is to achieve tumour cell destruction. These techniques are either used to palliate pain related to tumour invasion or to achieve a definitive local destruction of oligometastatic disease. Various techniques are available such as surgical resection, percutaneous ablation (cryotherapy, radiofrequency, microwave, HIFU, laser), embolisation (various embolisation agents can be used with or without the concomitant delivery of chemotherapy), and radiation therapy (conventional, IMRT, SBRT).

The goal of consolidative techniques is to provide a palliative stabilisation of a fracture or to preventively consolidate osteolytic lesions in weight bearing bones. Cementoplasty or “augmented” cementoplasty (cementoplasty in association with implantation of bone devices) are the most frequent techniques.

Combined therapies

The combination of different therapies can result in synergic effects for better clinical outcomes. Combination therapies can be the association of different anti-tumoural techniques or the association of anti-tumoural with consolidative techniques. Combining different anti-tumoural techniques can be discussed when the tumour volume is too large for single therapy. Some options include: radiation therapy after surgical resection, radiation therapy after percutaneous thermal ablation; arterial embolisation before surgical resection; arterial embolisation before percutaneous thermal ablation, and so on. Combination of anti-tumoural and consolidative techniques are of interest, especially for pain related to pathological fracture or for osteolytic tumours located in weight bearing bones, to prevent fractures and/or bone collapse.

Clinical situations

In a palliative setting, pain relief and prevention of SREs are the most common objectives. Understanding the pain mechanism is mandatory in order to choose the most appropriate strategy for pain relief and to balance stabilisation of a fracture with tumour cells destruction.

Stabilisation of a fracture line is the key for patients suffering from a fracture. Typically, the pain mechanism is “mechanical”, increasing with motions and decreasing with rest. Surgical stabilisation, cementoplasty (percutaneous injection of bone cement) or “augmented” cementoplasty are highly effective for this purpose and must be the first- and single-line treatment. However, pain related to a pathological fracture can also come from the tumour itself. In this case, stabilisation of the fracture line must be associated with anti-tumoural techniques, for better outcomes. Thus, radiation therapy is often used after stabilisation of a pathological fracture [7].

For pain related to the tumour, radiation therapy has been historically considered as first-line therapy. Interestingly, its association with another anti-tumoural technique is synergic. Thus, cryotherapy in association with radiation therapy has demonstrated a better palliation than single therapies (radiotherapy alone or cryotherapy alone) in a series of 175 patients [8].

For patients suffering from a painful metastasis located in weight-bearing bone, consolidation is required regardless of the anti-tumoural technique used for pain palliation. Indeed, the destruction of the tumour also results in weakening the bone structure in the surrounding area and must be balanced by prophylactic consolidation.

In a curative setting, definitive destruction of bone metastasis could be of interest in oligometastatic patients, or in patients with dissociated metastatic growth to preserve further systemic lines [9].

Thermal ablation techniques can be used as a stand-alone therapy for small tumours (less than 2 cm), without any cortical bone erosion or neurological structures in the vicinity [4]. Combination therapy must be discussed otherwise. For instance, the combination of percutaneous thermal ablation and SBRT is promising to achieve complete ablations for tumours next to vulnerable structures (neurological, digestive or urinary tract). In addition, it seems that better results can be obtained if percutaneous thermal ablation is associated with arterial embolisation in hypervascular metastases (renal cell carcinoma, hepatocellular carcinoma or neuroendocrine tumour metastases) [10]. High quality pre-operative imaging (CT, MRI and functional imaging) is needed to best tailor the ablation planning, and early post-ablation imaging is also mandatory to detect residual tumour, which may require an additional ablative anti-tumoural technique.

The knowledge of available techniques, and of their respective advantages and limitations, offers various therapeutic options and combinations to patients with bone tumours. Specialised multidisciplinary teams need to integrate these possibilities into the patient’s comprehensive care plan.

References:

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 1204 – Embolisation News on Stage**

1204.1 Sublingual glyceryl trinitrate improves prostate artery visibility on CTA performed preoperatively for prostate artery embolization
   A. Macdonald (Oxford/UK)

1204.2 Are formal urodynamic studies an essential investigation prior to prostate artery embolisation (PAE)?
   D. Maclean (Southampton/UK)

1204.3 A common woodchuck (Marmota monax) as a model for hepatic embolization
   W. Pritchard (Bethesda, MD/US)

1204.4 Embolization of the geniculate arteries is a safe and effective treatment for recurrent hemarthrosis following TKA
   L.J. van Baardewijk (Nijmegen/NL)

1204.5 CT liver perfusion for hepatocellular carcinoma nodule detection and follow-up after trans-arterial chemoembolization and comparison with hepato-specific contrast MRI: work in progress
   A. Hatzidakis (Iraklion/GR)

1204.6 When the prostatic artery does not originate from hypogastric branches, what to do for attaining good results in prostatic artery embolization?
   A.G. Rampoldi (Milan/IT)

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- Demonstrated conformability in venous anatomy

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Inferior vena cava filters are devices that have been available for over 40 years, but are associated with more controversy, uncertainty and fear than ever before. Interruption of the inferior vena cava (IVC) to prevent pulmonary embolism (PE) is a widely accepted clinical concept and has been practiced since at least 1910 [1]. Yet, now in 2017, IVC interruption has reached unprecedented levels of controversy, with some clinicians questioning the use of IVC filters in almost any situation [2]. At the same time, few are questioning the benefit of removing filters, and significant effort is being expended to increase retrieval rates and develop advanced techniques. This is all occurring amidst massive lawsuits against manufacturers of these devices, which has heightened public awareness of and concern towards these devices.

The United States has always placed more IVC filters than any other country, with far greater growth in overall filter utilization [3]. Interestingly, the observed rate of filter placement in Medicare patients with PE has remained stable over time despite an increase in the number of PE diagnoses [4]. Across the country, filter utilization varies from state to state, city to city and hospital to hospital [5]. Despite the liberal use of filters in the USA, placement rates are now decreasing, with the reduction in IVC filter placements, is a filter that automatically ceases to function as a filter after a specified period of time. The Sentry filter (Novate Medical) is a permanent implant that spontaneously converts from an IVC filter to an open IVC stent at a minimum of 60 days (Fig. 2) [14]. The mechanism of conversion is a biodegradable filament that gathers together the metal filtration elements of the device.

In the absence of level 1 data proving the efficacy and safety of IVC filters, all indications are considered suspect by some. This creates an environment in which some patients may face unnecessary risk of PE if devices are withheld. In reality, there is no equipoise regarding the link between DVT and PE, the link between PE and morbidity or lethal outcomes, or the role of anticoagulation in the treatment of VTE. In other words, few clinicians would doubt these links. There is enough of an indication that filters prevent PE, from both the randomised studies and less robust retrospective population studies, that it would be impossible to perform a randomised prospective clinical trial in patients with VTE to test whether IVC filters prevent morbidity and/or lethal PE in the absence of anticoagulation [10][11].

The overall decreases in IVC filter placements, the negative attitude in the medical community and public, the challenges of achieving high rates of filter retrievals and a hostile legal environment for manufacturers have greatly influenced the next generation of devices. The value proposition for any new device must be compelling in this environment and address some of the major limitations of current devices. An approach to a short-term risk of PE that addresses the concerns about long term indwelling devices and low retrieval rates is a temporary filter (one that is tethered to an externalised catheter). Although there have been several devices available in Europe in the past, the Angel Catheter (Bio2 Medical) is the only temporary filter that is FDA- and CE-approved in the United States (Fig. 1) [12]. Intended for ultrasound-guided placement from a femoral approach at the bedside, the device has a 30-day dwell time and can be used for infusion. Encouraging early clinical experience has recently been reported [13].

Another approach to reducing the need for a second procedure (to remove or convert the filter), and simultaneously address low retrieval rates, is a filter that automatically ceases to function as a filter after a specified period of time. The Sentry filter (Novate Medical) is a permanent implant that spontaneously converts from an IVC filter to an open IVC stent at a minimum of 60 days (Fig. 2) [14]. The mechanism of conversion is a biodegradable filament that gathers together the metal filtration elements of the device. When released, these elements flatten against the wall of the IVC like stent struts. The filter was approved by the FDA on February 17, 2017.

A filter that is entirely absorbed also addresses the issues of second procedures and low retrieval rates. Adent Medical has developed a polydioxanone device that retains filtration integrity for as long as 10 weeks but can be completely absorbed (Fig. 3) [15]. This device is first-in-man clinical trials, with a subsequent US clinical trial in the planning phase. A key management consideration with devices that automatically convert or absorb is that dedicated post-placement follow-up is still required. These devices will lose their ability to protect the patient from PE regardless of the patient's clinical or anticoagulation status, so that additional devices may be needed in some circumstances.

After almost 50 years of clinical availability, filter practice remains largely directed by opinion rather than fact. As physicians treating venous thromboembolism, we must support filter registries and trials and use these devices responsibly in order to continue to have access to IVC filters for our patients.

**References:**

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**Fig. 1:** The Angel Catheter (courtesy of Bio2 Medical).
**Fig. 2:** The Sentry Filter (courtesy of Novate Medical).
**Fig. 3:** The Adent Medical Filter (courtesy of Adent Medical).
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European Conference on Interventional Oncology
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LEADERS IN ONCOLOGIC INTERVENTIONS

Cardiovascular and Interventional Radiological Society of Europe
Sirfox and Foxfire: latest global results

Thomas Helmberger, EBR

Worldwide, more than 1.5 million new cases of colorectal cancer (CRC) are diagnosed per year. About 25% of CRC patients will present with synchronous metastases, an additional 20% of patients may develop metachronous metastases, whereas 30–35% will suffer from liver-only disease [1]. 80–90% of patients with liver metastases will have non-resectable metastases, which raises the need for systemic therapies. Proven and established frontline therapies in metastatic CRC are fluorouracil, irinotecan and oxaliplatin (FOLFOX) or irinotecan (FOLFIRI) +/- biological drugs targeting specific humoral factors (VEGF, EGFR) or tumour cells with gene mutations (e.g. RAS, BRAF) [2].

The encouraging results of the combination of modern chemotherapy regimens (e.g. CPT, 5-FU, irinotecan, oxaliplatin) and biological therapies gave rise to three large trials in the mid-1990s in salvage, first- and second-line systemic chemotherapy (CTx) and radioactive yttrium-90 radioembolisation. In consequence, the disproportionately high rate of advanced stage IV patients in the presented studies might explain that the significantly improved hepatic PFS in the RE arm did not finally translate into a major contribution of RE to systemic therapy with respect to overall survival. In summary, the SIRFLOX, FOXFIRE and FOXFIRE global trials could not confirm an overall survival benefit from adding RE to FOLFOX first-line chemotherapy. Ongoing subgroup analysis may clarify if the superior hepatic response rates to RE were counteracted by the surprisingly advanced stage of disease in the study population and by the reduced post-protocol systemic therapy in the FOLFOX + RE patients. Nevertheless, the three studies could confirm earlier data of an improved response of metastatic liver disease to RE, which still underlines the importance of the absence of clinically leading extrahepatic disease when selecting patients for RE.

Table 1: Characteristics of SIRFLOX, FOXFIRE and FOXFIRE global trial (3)

<table>
<thead>
<tr>
<th>Study type</th>
<th>SIRFLOX</th>
<th>FOXFIRE</th>
<th>FOXFIRE global</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geographic region</td>
<td>ANZ, EME, USA</td>
<td>ANZ, AF, EME, USA</td>
<td>ANZ, AF, EME, USA</td>
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<tr>
<td>Patients</td>
<td>530</td>
<td>534</td>
<td>209</td>
</tr>
<tr>
<td>Eligibility criteria</td>
<td>Adenocarcinoma of the colon or rectum</td>
<td>Liver metastases not surgically resectable or ablatable</td>
<td>Eligible for systemic chemotherapy as first-line treatment for metastatic CRC</td>
</tr>
<tr>
<td>Type of CTx-regimen</td>
<td>Synchronous metastases 86.5%</td>
<td>Hepatic involvement &lt;25% 30.6%</td>
<td>Extrapleural metastases 34.8%</td>
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Table 2: Patients’ characteristics (3)

<table>
<thead>
<tr>
<th>Study type</th>
<th>SIRFLOX</th>
<th>FOXFIRE</th>
<th>FOXFIRE global</th>
</tr>
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<tr>
<td>Number of patients</td>
<td>540</td>
<td>554</td>
<td>554</td>
</tr>
<tr>
<td>Median age (years, range)</td>
<td>63 (23–89)</td>
<td>63 (28–90)</td>
<td>63 (23–90)</td>
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<td>Performance status (WHO 0-1)</td>
<td>65 (37.4%)</td>
<td>65 (37.4%)</td>
<td>65 (37.4%)</td>
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<tr>
<td>Intent to treat with biologicals</td>
<td>54.5%</td>
<td>53.8%</td>
<td>53.8%</td>
</tr>
<tr>
<td>Primary tumour in situ</td>
<td>55.9%</td>
<td>50.2%</td>
<td>50.2%</td>
</tr>
<tr>
<td>Hepatic involvement &lt;25%</td>
<td>86.5%</td>
<td>30.6%</td>
<td>32.3%</td>
</tr>
<tr>
<td>Type of CTx-regimen</td>
<td>Full dose of FO</td>
<td>FO</td>
<td>FO</td>
</tr>
<tr>
<td>Number of cycles of FO</td>
<td>12 (7–13)</td>
<td>46%</td>
<td>46%</td>
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<td>Patients with bevacizumab</td>
<td>1.6%</td>
<td>46%</td>
<td>46%</td>
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<tr>
<td>Patients with cetuximab</td>
<td>74%</td>
<td>46%</td>
<td>46%</td>
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<tr>
<td>Subsequent chemotherapy</td>
<td>0.026</td>
<td></td>
<td></td>
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Table 3: Summary results (3)

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<th>Adverse events</th>
<th>SIRFLOX</th>
<th>FOXFIRE</th>
<th>FOXFIRE global</th>
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<tr>
<td>Neutropenia 66.5%</td>
<td>24.2%</td>
<td>36.7%</td>
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<tr>
<td>Thromboembolism 1.2%</td>
<td>1.2%</td>
<td>27.7%</td>
<td></td>
</tr>
<tr>
<td>Leukopenia 2.3%</td>
<td>2.3%</td>
<td>5.9%</td>
<td></td>
</tr>
<tr>
<td>Fatigue 4.9%</td>
<td>4.9%</td>
<td>8.5%</td>
<td></td>
</tr>
<tr>
<td>Abdominal pain 2.3%</td>
<td>2.3%</td>
<td>6.1%</td>
<td></td>
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<tr>
<td>Peripheral neuropathy 5.8%</td>
<td>5.8%</td>
<td>3.6%</td>
<td></td>
</tr>
</tbody>
</table>

References:
DID YOU KNOW?
PRE-CLINICAL TESTING SHOWED THREE DCBs PRODUCED DOWNSTREAM CRYSTALLINE MATERIAL.

Percentage of sections observed with crystalline material in downstream non-target tissue from arteries harvested at 28 days.
Pre-Clinical head-to-head comparison of downstream crystalline material.
After the initial failure to transfer the most successful concept of drug-eluting stents to peripheral arteries [10,11], the group in Tübingen, Germany, initiated, in a second attempt, a clinical trial with new concepts of drug delivery. Instead of relying on sustained release of a small dose of the efficacious Sirolimus from permanently implanted stents, we applied Paclitaxel as the active ingredient and very low-lasting drug delivery by either 100 μl of commercial angiographic X-ray contrast agent as a carrier (Fig. 1a) or the surface of a PTA balloon.

The study, named “Thunder”, was encouraged by recently presented animal experiments indicating pronounced inhibition of neointimal proliferation and surprisingly good tolerance even in coronary arteries [2,3]. In these initial animal experiments, two formulations and two dose levels were tested on balloons: the higher dose was found to be non-toxic once the added contrast agent provided stronger inhibition of neointimal proliferation than the versions without the additive or with the additive but at lower dose.

The first clinical study yielded a variety of results guiding the further development: PTA procedures were performed as usual with only very slight deviations from the standard protocols. The use of the paclitaxel-coated balloons reduced the restenosis rate very significantly, whereas Paclitaxel admixed to the contrast medium yielded DCB with distinctly superior efficacy to the plain balloon and plain contrast only. The use of the paclitaxel-coated balloons for the active drug. The proportion of the drug to the drug carrier was 2:1 for the Paocorat™-formulation used in the Thunder trial and varies currently from 50 parts drug to 1 part carrier (Orchid) to 1:1 (Freeway).

Fig. 1: Selected drug carriers

Active ingredient: all paclitaxel; additives and published results on efficacy (preferentially in coronary arteries) [2,3]. In these initial animal experiments, two formulations and two dose levels were tested on balloons: the higher dose was found to be non-toxic once the added contrast agent provided stronger inhibition of neointimal proliferation than the versions without the additive or with the additive but at lower dose.

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Venous disease doesn’t get the attention it deserves, but together we can change that. We are calling on visionaries as we work to shed light on venous disease treatment.

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IMPORTANT: Warnings, precautions, and instructions for use can be found in the product labeling.
Thoraco-abdominal aortic aneurysms (TAAAs) are considered challenging clinical scenarios. Despite the introduction of more innovative and less invasive surgical approaches, TAAA open repair (OR) has substantial mortality and morbidity rates, even in high volume centres. Coats et al. reported the largest experience of TAAAs treated by OR in 3,309 cases with 8% operative deaths, 5% spinal cord ischaemia and 6% post-operative dialysis. Post-operative cardiac and pulmonary complications amounted to 26% and 36%, respectively (1). Results may be worse in centres with lower case volume or experience.

Fenestrated and branched endografts (FB-EVAR) are nowadays available for treatment, offering options to treat aortic aneurysms involving renal and splanchic arteries. Several experiences reported the FB-EVAR feasibility and effectiveness for juxtaperi-renal abdominal aortic aneurysms (2,3,4).

For the first time, in 2001 Chuter et al. reported total endovascular repair of TAA by branched endograft (5). In 2010, Bakoyannis et al. reported the first literature review of the TAAAs endovascular repair by FB-EVAR. Only 7 studies (with early results) were collected for an overall of 155 cases. Technical success was 94%, 30-day success was 71% and spinal cord ischaemia was 9.6% (paraparesis 7.1%, paraplegia 2.9%). Re-interventions occurred in 17% of cases (6).

In the last years, thanks to the technology evolution and increased knowledge, several papers were published reporting early and mid-term results. Table 1 and 2 summarise peri-operative and follow-up results of papers published in the last years with more than 150 cases (7,8,9,10,11).

In our opinion, the advantages of new technologies which have allowed for improved results of TEVAR for TAAAs in the last years, can be summarised as: pre-operative planning tools; hybrid rooms and vessels navigator; staged procedures; off-the-shelf endograft; improved knowledge and dedicated teams.

Pre-operative planning is crucial for a successful FB-EVAR procedure. Case planning for FB-EVAR requires expertise in CT angiography analysis and the ability to design a multi-modular endograft with fenestrations or branches according to the aorto-iliac anatomy. It is time-consuming and requires an experienced team and instruments. Dedicated software is nowadays available in order to perform an accurate aorto-iliac and visceral vessels anatomical evaluation. With CT post-processing software, we can volume rendering, multi-planar and centre lumen line reconstructions or angiographic simulation. According to these reconstructions, particular evaluations can be performed in order to plan a custom made endograft, the endovascular strategy and to optimise the entire procedure (patient position, access and amount of contrast media).

Hybrid rooms, combining open surgical environment and advanced imaging capabilities are currently replacing mobile C-arms in the operating room (12). The latest hybrid rooms have advanced imaging applications, such as contrast-enhanced cone beam computed tomography and pre-Operative CTA image fusion (12). The latter facilitates endovascular procedures (vascular navigator – a sort of 3D road map) and increases the accuracy of endograft implantation and the target vessel occlusion cannulation (12). Literature data demonstrated that hybrid room and vessels navigator significantly reduce the exposure to radiation (for both patient and physicians) and the total amount of iodinated contrast injection during FB-EVAR (12).

Spinal cord ischaemia remains a catastrophic complication after TAA repair. After OR, the rate of SCI ranges between 4 and 11% (13,14), related with the extension of the aortic disease (TAAA type II > I > IIIa) (15,16). After endovascular repair of TAAA, the SCI ranges between 3 and 17% if we consider the first experiences. Recently, different endovascular/ surgical strategies were proposed to reduce the rate of SCI. Kapravelos et al. reported a reduction of 5% of SCI by using the temporary sac perfusion (16). Maurer et al. associated the concept of the temporary sac perfusion with the early lower limb perfusion strategy. According to this protocol, the SCI rate was <3%. Both these approaches are part of the pre-conditioned theory of the spinal vascular blood supply (17,18). We always used this approach when it was possible to use the permissive delay of both hypogastric and superior mesenteric arteries, and we reported an overall rate of spinal cord ischaemia of 6% (considering both operative and peri-operative SCI).

Customisation of an appropriate commercially available FB-EVAR design requires usually 6-8 weeks and is a wide application of this technology in urgent patients, such as cases with large asymptomatic and symptomatic/ ruptured TAAA. In order to expand the availability of FB-EVAR technology to the acute setting, “off-the-shelf” solutions have been proposed to accommodate as many different anatomical configurations as possible (19). Based on this platform, the first-off-the-shelf 4-branched endograft, the Zenith T-Branch endograft (Cook Medical), was employed and commercially available, starting in September 2012 to treat acute TAAA. Preliminary experiences suggested that T-Branch is a safe and effective therapeutic option for urgent total endovascular TAAA repair, in which a custom-made endograft is not possible in time (19,20). Recently, we reported our experience on urgent TAAA endovascular repair by T-Branch with encouraging results at early and mid-term follow-up (20).

In conclusion, the total endovascular TAAA repair is technically demanding, time-consuming, and requires advanced knowledge in endovascular materials and technologies as well as a dedicated team for planning, procedure and peri-operative management. The expertise is a key factor to treat challenging FB-EVAR cases. In 2016, Starnes published an experience about the importance of the learning curve in these advanced procedures (21). During the course of 13 consecutive single-surgeon FEVAR implantations, the authors have demonstrated statistically significant and clinically meaningful improvements in several outcomes during the study period, including peri-operative death or major complications, length of procedure, and early and mid-term outcomes. There was no increase in the proportion of patients suffering perioperative death or major complications from 23.5% in the first 20 cases to 20.8% in the fourth quarter. After adjustment for potential confounding factors, the odds of death or major complication were cut by 52.4% per quarter increase (21).
The importance of clinical knowledge and entrepreneurial thinking for the future of IR is increasingly being recognised. In order to account for this, a workshop called Successful Strategies for Interventional Radiology Practice is being offered at CIRSE 2017 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, where a diverse faculty will cover topics, such as building clinical business, clinical services, marketing and infrastructure in IR departments.

**Successful Strategies for IR Practice Workshop**

*Monday, September 18, 10:00-14:00*

*Room 20*

Pre-registration was required for this workshop. Interested delegates can enquire about last-minute vacancies at the room entrance half an hour before the workshop starts.

Participation is free of charge.
STUDENT CORNER
Risha Rose, CIRSE Office

5 Things to Know Before You Go… on a Night Out in Copenhagen

Tonight is the night! Join fellow students at the Students’ Evening for a night out on the town. Before you go out to enjoy the Danish partylife, here are a few good things to know about Denmark.

1. Danes are some of the happiest people on Earth

According to the United Nations’ World Happiness Report, Denmark topped the global happiness rankings in 2013, 2014 and 2016, and took second place behind Norway in 2017. Denmark’s happiness levels have long outdated these rankings, however, with the first knowledge of Denmark’s high happiness levels dating back to the 1970s. What makes the Danes so happy, might you ask? Besides their free university education, social security, universal health care, efficient infrastructure, paid family leave and ample vacation time a year, Danish people have several lifestyle habits, all based around healthy community relationships, that promote joy and well-being.

2. “Hygge”

This Danish term, which made the short list of Oxford Dictionaries Word of the Year 2016, is much older than its trending lifespan. Having first appeared in Danish writing in the 19th century, hygge (pronounced hoo-guh) captures the essence of the Danish culture, and is defined as a quality of cosiness and comfortable conviviality that stimulates feelings of contentment and well-being. For the Danes, however, hygge is much more than just this feeling of cosiness. Hygge is spending quality time with loved ones, it is drinking beer in a bar with friends, curling up by the fire, candle-lit dinners, Christmas time, pastries, wool sweaters… Having one word that can mean so many wonderful things - no wonder the Danes are world leaders in happiness!

3. Bicycle Culture

The Danes have a long history of biking as a preferred means of transportation, and Copenhagen is famous for being the most bicycle-friendly city in the world. With around 400 km of designated bike lanes, Copenhageners prefer to bike rather than drive. In fact, only about a third of Copenhagen households own a car, while nine out of ten Danes own a bicycle. Locals bike to work, to school, when running errands, to bring their kids to kindergarten, and even to social gatherings: Sun, rain or snow, nothing stands in their way. Visitors can easily join in the fun by renting inexpensive city bikes to experience this convenient, healthy and eco-friendly way of travelling.

4. Green Living

Speaking of eco-friendly, Copenhagen is one of the leading innovators when it comes to green living. In 2014, it won European Green Capital, and the city aims to become the world’s first carbon neutral capital by 2025. While in Copenhagen, visitors can experience the sustainable lifestyle for themselves by swimming in the clean waters of the city’s harbour bays (okay – it may be a bit too cold in September), staying at sustainable hotels, eating organic food and exploring the city by bike. Copenhagen has so many sustainable methods set in place that it is hard not to participate in the richly green lifestyle.

5. Noteworthy Danish Names

Denmark is home to several famous historical figures that have pushed the country into the spotlight time and time again. Perhaps the most notable Dane, with his timeless children’s fairy tales, is Hans Christian Andersen. His work has been translated into over 150 languages worldwide, and Copenhagen’s renowned Little Mermaid sculpture is inspired by his fable. Denmark’s fame does not stop there, however, and originations in science and medicine have been abundant throughout the years. To name a few outstanding minds: August Krogh won the Nobel Prize for medicine in 1920 and won on to introduce insulin treatment in 1922, Johannes Füger transformed the way cancer was researched when he produced experimental proof of cancer being caused by external factors; and, of course, 1922 Nobel Prize winner Niels Bohr, the pioneering physicist who revolutionised the world’s understanding of the structure of an atom, are among the greatest of the great Danes that everyone visiting Denmark should know about.

Recommended for Students Today!

Mentoring Breakfast
09:00 – 10:00, Students’ Lounge

FC 1003: Ablative therapies of renal cancer
10:00 – 11:00, Auditorium 10

ETF: IR training opportunities in the US
12:45 – 13:00, ETF Pavilion

IDEAS ECD 1405: Emergencies – how to manage the complex acute case
16:15 – 17:15, Auditorium 3

IDEAS WS 1504: Fundamental of EVAR
17:30 – 18:30, Auditorium 3

CIRSE Students Evening
20:00
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, 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

<table>
<thead>
<tr>
<th>Time</th>
<th>Mini-Talk</th>
<th>Speaker</th>
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<tbody>
<tr>
<td>SUN</td>
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<td>SEPT 17</td>
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<tr>
<td>09:30 - 09:45</td>
<td>GeoAlign® Marking System (Bard)</td>
<td>A. Spinelli (Cagliari/IT)</td>
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<tr>
<td>09:45 - 10:00</td>
<td>Personal radiation protection apparel (protective aprons and goggles)</td>
<td>G. Bartal (Kfar-Saba/IL)</td>
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<tr>
<td>11:00 - 11:15</td>
<td>Radiation-related illnesses and radiation safety in the cathlab (Radpad)</td>
<td>E. Radtke (Kansas City, KS/US)</td>
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<tr>
<td>11:15 - 11:30</td>
<td>How to reduce patient and personnel exposure during prostate embolisation?</td>
<td>F.C. Carnevale (São Paulo/BR)</td>
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<tr>
<td>12:30 - 12:45</td>
<td>Peak skin dose: trigger level to implement dose optimisation and patient-oriented best practice (Bracco/PACSHealth)</td>
<td>A.G. Rampoldi (Milan/IT)</td>
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<tr>
<td>12:45 - 13:00</td>
<td>Cancer risks in IR personnel</td>
<td>G. Bartal (Kfar-Saba/IL) G. Paulo (Coimbra/PT)</td>
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<tr>
<td>13:00 - 13:15</td>
<td>Tips and tricks: how to control radiation exposure in selective internal radiotherapy (SIRT)?</td>
<td>R. Adamus (Nürnberg/DE) G. Paulo (Coimbra/PT)</td>
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<tr>
<td>14:00 - 14:15</td>
<td>Basic safety standards directive: what’s new for equipment and manufacturers</td>
<td>E.P. Efstathopoulos (Athens/GR)</td>
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<tr>
<td>14:15 - 14:30</td>
<td>How to manage patient and staff exposure in an interventional radiology department (Philips)</td>
<td>M.W. de Haan (Maastricht/NL)</td>
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3x Balloons Observed at 28 Days

Comparison of Particulate Embolization after Femoral Artery Treatment with competitor 1 versus LUTONIX® 035 Paclitaxel-Coated Balloons in Healthy Swine.
Frank D. Kolodgie, PhD, Erica Pacheco, MS, Kazuyoshi Yahagi, MD, Hiroyoshi Mori, MD, Elena Ladich, MD and Renu Virmani, MD

Arrows indicating crystalline material observed at 28 days. 1X and 3X Balloons.

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