IR congress news

CIRSE 2017 – Copenhagen
Sunday, September 17, 2017

Raman Uberoi

Otto van Delden

Streamlining Education and Training in IR

Interventional radiology is a highly specialised and rapidly evolving subspecialty, which requires constant updates of its training and education.

In order to stay abreast of these changes, a special Task Force, led by Raman Uberoi, has recently completed the second version of the European Curriculum and Syllabus for Interventional Radiology, which serves as the framework for the popular European Board of Interventional Radiology (EBIR) exam.

Find out more at www.cirse.org/curriculum

European Curriculum and Syllabus for Interventional Radiology

Second Edition

Revising the European Curriculum and Syllabus for IR

Petra Mann and Michelle Weiss, CIRSE Office

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 Anna-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 test it is today. To date, over 500 interventional radiologists hold this coveted qualification, and the number is steadily increasing. The EBIR exam obtained recognition from the UEMS-CESMA after a rigorous scrutiny process in March 2017, and is also endorsed by the European Society of Radiology (ESR) and the UEMS Interventional Radiology Division.
As more and more organisations and national societies approve and recommend this exam, its value is increasing and more countries are moving to adopt the EBIR as a national IR exam; such was the case in Australia and New Zealand, where the EBIR exam began taking place in 2015. As Examination Council Chairperson Otto van Delden puts it, "It's probably the best example of where the exam is already turning into *the* exam for IRs. They're frontrunners in that respect. In the Netherlands, we're not that far yet, but we're working on making EBIR the official national IR exam as well. It's more practical and more useful to join it, and I know of other countries that are thinking about doing the same. This will all help making it a more recognised, standardised, accepted exam." Having the EBIR qualification is not only an advantage for IRs in terms of career development but also in the free movement of IRs around Europe and the world.

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 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

Don't miss it !
Hot Topic Symposium
Aorta
Sunday, September 17, 15:00-16:00
Auditorium 1

IDEAS 2017

Should individualised follow-up after EVAR be the standard of care?

Jos C. van den Berg

Jos C. van den Berg
Ospedale Regionale di Lugano
Lugano, Switzerland

Jos van den Berg began his work as an interventional radiologist in 1994 at St. Antonius Hospital in Nieuwegein, The Netherlands, becoming Head of its Department of Radiology in 2001. In 2004, he accepted the post of Head of the Service of Interventional Radiology in the Ospedale Regionale di Lugano, Switzerland. He also acts as an Associate Professor of Radiology at the Medical Faculty of the University of Bern. Prof. van den Berg is a past-President of the Dutch Endovascular Forum, and an active member of the Dutch Society of Radiology, CIRSE, SIR and the Swiss Society of Cardiovascular and Interventional Radiology.

The use of EVAR for the treatment of aneurysms of the abdominal aorta has become widespread in the last decades, and this therapy is increasingly being used in younger patients with a longer life expectancy.

Unlike open surgical repair, EVAR still requires regular imaging follow-up. The typical follow-up consists of CT angiography or duplex ultrasound performed at regular intervals (typically at 1 month, 3 months, 6 months, 12 months, and then yearly thereafter). Standard tri-phasic CT yields a dose of 20–30 mSv (equivalent to 300–400 plain X-rays) and the related theoretical lifetime risk of radiation-induced cancer is 1 in 2,000 patients (0.05%). At 1 and 5 years, the mean effective dose may add up to 72.4 mSv, and 144.8 mSv respectively.

Furthermore the repetitive administration of iodinated contrast medium has been implicated in chronic oxidative renal injury, contributing to a steady decline in renal function, which may eventually lead to renal failure. The use of ultrasound for long-term surveillance, extension of follow-up time intervals, or a combination of both, is mostly restricted to experienced centres. CT-based follow-up, although highly reliable, is hampered by the significant exposure to ionising radiation. The last aspect of follow-up imaging is the significant economic burden that may comprise 30–50% of the costs of EVAR follow-up (65% of these costs being induced by CT examinations).

Especially in younger patients, there is a need for a more tailored approach to EVAR follow-up. The reduction in imaging follow-up has been facilitated by the development of newer generation stent grafts, and a better knowledge of the behaviour of stent grafts, the importance of endoleaks, the mechanisms of stent graft failure, and optimal sizing and planning (using 3D tools). Imaging follow-up is able to evaluate aneurysm size (both diameter and volume), stent graft integrity, migration, patency of the limbs of the stent graft, and endoleaks (both the presence – including low-flow endoleaks – as well as the classification). It has become clear over time that follow-up is probably not needed to address all these features, and that imaging should focus on what really counts. Follow-up should, therefore, focus on prevention of impending aneurysm rupture that is typically clinically inconspicuous (as compared to limb occlusion that can be easily picked up by clinical examination).

Reduction of radiation exposure and cost can be achieved by changing the imaging modality, the imaging protocols and the imaging interval.

The surveillance modalities (historically) used are plain abdominal radiography, ultrasound (duplex or contrast-enhanced ultrasound – CEUS), CT angiography and MR angiography. The optimal modality to use is the subject of ongoing debate and a lot of the discussion focuses on which modality is best at detecting any type of endoleak but in the end, only those endoleaks that matter (and require treatment) need to be detected, since secondary interventions for endoleaks are only performed 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. In cases where high-quality per-procedural imaging has demonstrated adequate overlap of the modular parts of the stent-graft, the role of plain abdominal radiography has become very limited.

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 necessary. 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 phase imaging, but the significance of demonstrating such an endoleak is low since there is little evidence that the possibility to pick up a type II endoleak in the delayed phase translates into a clinically significant advantage.

There is also evidence that endoleaks that are identified in late-phase imaging only resolve spontaneously without intervention. The absence of an early endoleak has been shown to identify a patient cohort at a substantially reduced (but not absent) risk for subsequent aneurysm-related morbidity. It must be kept in mind that less than 10% of patients benefit from yearly CT follow-up after EVAR, and therefore less frequent CT is sufficient in the majority of patients. After EVAR, a 3- or 6-month CT after a normal 1-month CT result does not identify any clinically significant findings warranting intervention and can be omitted safely from the follow-up schedule. Patients with aneurysm sacs that are stable or shrinking at 1 year, and no evidence of endoleak on a CT scan performed at 1 year, do not require regular CT scanning anymore. Problems that might occur in this group of patients can be easily identified by ultrasound and/or clinical evaluation. The exception to this rule is first-generation stent grafts, without suprarenal fixation. CT scanning also remains crucial when re-intervention is planned. MRI allows for accurate measurements of aortic diameter and is more sensitive compared to CTA for the detection of post-EVAR endoleaks, especially for the detection of type II endoleaks. MRI should be considered in patients with continued AAA growth and negative or uncertain findings at CTA.

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 endoleak 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.

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 1406 TIPS and portal vein intervention
Room 20
Outcomes of percutaneous portal vein intervention in a single UK paediatric liver transplantation programme
J.V. Patel[1], J. Mahaveer[1], R. Patel[2], N. Tahir[1], S. Rajwal[1], P. McClean[1];
[1]Leeds/UK, [2]Cambridge/UK

FP 1407 Oncology 1
Room 19
Systemic T cell reactivity with respect to immune status and survival following ablative treatment of locally advanced pancreatic cancer by irreversible electroporation
H.J. Scheffer, A.G. Stam, L.G. Vroomen, T.D. de Gruijl, M.R. Meijerink; Amsterdam/NL

FP 1408 Embolotherapy
Room 18
Safety and efficacy in the use of superselective radiofrequency embolization wires in small animal arteries
M. Guimaraes; Charleston, SC/US

17:30-18:30

FP 1505 Experimental work in IR
Room 19
CT visibility of different types of embolic materials with particular deep penetration into the liver: 40-µm visible bead versus iodized oil
D. Vollherbst[1], T.L. Gockner[2], T.D. Do[1], K. Holzer[1], C. Mogler[3], P. Flechsig[1], A. Harms[1], C.L. Schlett[1], P.L. Pereira[4], H.U. Kauczor[1], G.M. Richter[5], C.M. Sommer[1];
[1]Heidelberg/DE, [2]Mainz/DE, [3]Munich/DE, [4]Heilbronn/DE, [5]Stuttgart/DE

FP 1506 Biliary intervention
Auditorium 11
The when and how of biodegradable biliary stents in a paediatric group: is it better than what is used currently
S. Dyer Hartnett, I. Díez Miranda, C. Gonzalez-Junyent, G. Sempere Campello, C. Parra-Fariñas, M. Pérez Lafuente, A. Segarra Medrano; Barcelona/ES

FP 1507 IR in gynaecology
Room 18
Chemoembolization of uterine arteries for treatment of non-tubal ectopic pregnancy with positive fetal cardiac activity
M. Saksonov, A. Belenky, H. Krissi, S. Litvin, M. Knizhnik, G. Chudakov; Petah Tikva/IL

FP 1508 Venous and IVC intervention
Auditorium 12
Optimum duration and dose of r-tPA with the acoustic pulse thrombolysis procedure for intermediate-risk (submassive) pulmonary embolism (OPTALYSE PE)
K.M. Sterling[1], N. Jones[2], G. Piazza[3], S. Goldhaber[3], V. Tapson[4];
[1]Alexandria, VA/US, [2]Columbus, OH/US, [3]Boston, MA/US, [4]Los Angeles, CA/US

FemoSeal™

Angio-Seal™

VASCULAR CLOSURE DEVICES

Now, by TERUMO INTERVENTIONAL SYSTEMS

www.terumo-europe.com

Angio-Seal and FemoSeal are not available for sale in all countries. This information is provided only in respect to markets where this product is approved or cleared.
Please contact your Terumo local sales representative for more information.

IS634GB1116IT1

Don't miss it !
Andreas Gruentzig Lecture
Honorary Lecture
Sunday, September 17, 14:30 – 15:00
Auditorium 1

Percutaneous treatment of cystic echinococcosis: current concepts

Okan Akhan

Okan Akhan
Hacettepe University
Ankara, Turkey

Dr. Okan Akhan is a Professor of Radiology at Hacettepe University in Ankara, Turkey, where he works in non-vascular interventional radiology and in abdominal radiology. His main research fields include percutaneous treatment of hydatid cysts, percutaneous treatment of abdominal cysts, non-vascular interventions of abdominal and thoracic diseases and imaging of diffuse liver diseases. Dr. Akhan has served for and contributed to scientific journals, presented at international scientific meetings and congresses, and is a member of many international radiology associations.

Cystic echinococcosis (CE), traditionally known as hydatid disease, is caused by echinococcus granulosus. 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 [3,4].

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 12.5%-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 used 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].

The PAIR technique

First described by Ben-Amor et al. in 1986. PAIR is an abbreviation which stands for

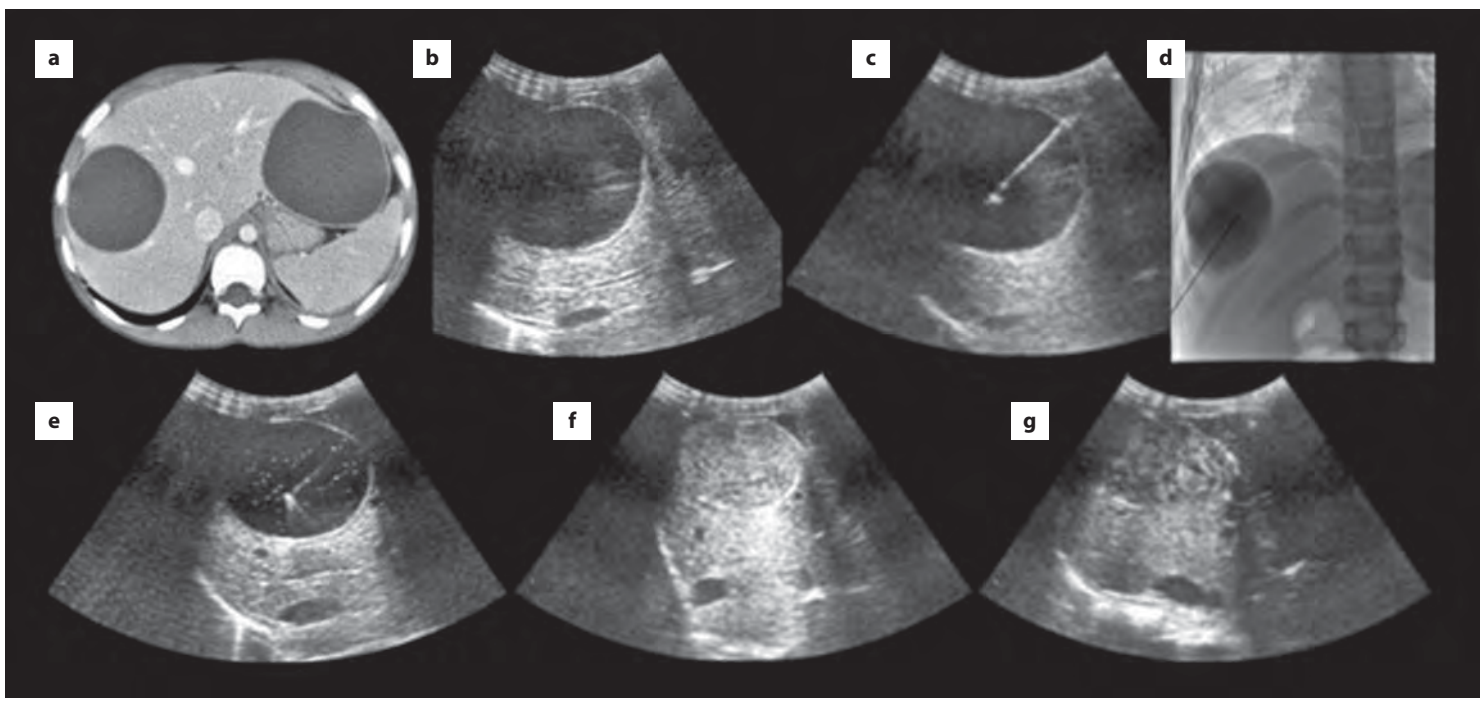


Fig. 1: CE 1 (according to WHO classification) with double-contour sign were detected on an abdominal CT and US examination of 10-year-old female patient. ***(a-b)*** *Percutaneous treatment was performed using PAIR* ***(c-f)****. 2-year follow-up ultrasound showed a "pseudo-tumour appearance" representing a dead remnant* ***(g)****.*

puncture (P), aspiration of cyst content (A), injection of hypertonic saline solution (I), and re-aspiration (R) of all cyst fluid [12].

Catheterisation technique

This technique is based on using hypertonic saline and alcohol, in a sequential manner, and was first described by Akhan et al. in an experimental animal study in 1993. It is essentially a modification of the PAIR technique recently named as the "standard catheterisation technique" [11,13].

Modified catheterisation technique (MoCaT)

First defined by Akhan et al in 2007, this technique employs a 14 Fr catheter placed into the cavity, using a standard Seldinger technique, to evacuate all the cyst content (including fluid, daughter vesicles and degenerated membranes). The cavity is then rigorously cleansed with isotonic saline (0.9% NaCl) with an irrigation technique which was referred to as "effective and aggressive irrigation". Before the withdrawal of the catheter, sclerosis of the cavity by ethanol is performed [14,15].

Results and complications

Liver CE is successfully treated with percutaneous techniques. It is associated with high treatment rates (more than 96%), as reported recurrence rates are maximum 4% in which the recurrent cyst can be treated with a repeat procedure.

Considering the number of percutaneously treated patients, the reported mortality rate 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, cystobiliary 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 38.5ºC, 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 [1,4, 16-24].

Conclusions

Percutaneous treatment of liver CE is an effective and safe approach with successful results, as PT 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 to be the first treatment option for active liver CE.

The percutaneous approach is also 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:

1. Akhan O, Ozmen MN, Dinçer A, et al. Liver hydatid disease: long-term results of percutaneous treatment. Radiology 1996; 198(1):259-64
2. WHO Informal Working Group on Echinococcosis. International classification of ultrasound images in Cystic Echinococcosis for application in clinical and field epidemiological settings. Acta Tropica 2003; 85, 253–261
3. Czermak BV, Akhan O, Hiemetzberger R, Zelger B, Vogel W, Jaschke W, Rieger M, Kim SY, Lim JH. Echinococcosis of the liver. Abdom Imaging. 2008;33(2):133-43
4. Kern P, Menezes da Silva A, Akhan O, Müllhaupt B, Vizcaychipi KA, Budke C, et al. The Echinococcoses: Diagnosis, Clinical Management and Burden of Disease. Abdominal imaging; 33: 133-143
5. Brunetti E, Kern P, Vuitton DA; Writing Panel for the WHO-IWGE. Expert consensus for the diagnosis and treatment of cystic and alveolar echinococcosis in humans. Acta Trop. 2010;114(1):1-16
6. Akhan O, Yildiz AE, Akinci D, Yildiz BD, Ciftci T. Is the adjuvant albendazole treatment really needed with PAIR in the management of liver hydatid cysts? A prospective, randomized trial with short-term follow-up results. Cardiovasc Intervent Radiol. 2014;37(6):1568-74
7. Yalin R, Aktan Ö, Açıkközlü S. Computed tomography and sonography of hydatid cysts of liver after surgical managemant. J Med Imaging. 1989;3:301-305.
8. Little JM, Hollands MJ, Ekberg H. Recurrence of hydatid disease. World J Surg. 1988; 12(5):700-4
9. Sayek I, Tirnaksiz BM, Doğan R. Surgery Today. Cystic Hydatid Disease: Current Trends in Diagnosis and Management. 2004; 34:987–996
10. Smego RA, Bhatti S, Khaliq AA, Beg MA. Percutaneous aspiration-injection-reaspiration drainage plus albendazole or mebendazole for hepatic cystic echinococcosis: a meta-analysis. Clin Infect Dis. 2003; 37(8):1073-83
11. Akhan O, Dincer A, Gököz A, et al. Percutaneous treatment of abdominal hydatid cysts with hypertonic saline and alcohol. An experimental study in sheep. Invest Radiol 1993; 28(2):121-7
12. Ben Amor N, Gargouri M, Gharbi HA, et al. Treatment of hepatic hydatid cyst in sheep by echographic puncture. Tunis Med 1986; 64(4):325-31
13. Akhan O, Ozmen MN. Percutaneous treatment of liver hydatid cysts. Eur J Radiol 1999; 32: 76–85
14. Akhan O, Gumus B, Akinci D, et al. Diagnosis and percutaneous treatment of soft-tissue hydatid cysts. Cardiovasc Intervent Radiol 2007; 30(3):419-25
15. Akhan O, Salik AE, Ciftci T, Akinci D, Islim F, et al. Comparison of Long-Term Results of Percutaneous Treatment Techniques for Hepatic Cystic Echinococcosis Types 2 and 3b. AJR Am J Roentgenol. 2017; 208(4):878-884
16. Filice C, Pirola F, Brunetti E, Dughetti S, Strosselli M, et al. A new therapeutic approach for hydatid liver cysts. Aspiration and alcohol injection under sonographic guidance. Gastroenterology. 1990;98(5 Pt 1):1366-8
17. Khuroo MS, Dar MY, Yattoo GN, Zargar SA, Javaid G, et al. Percutaneous drainage versus albendazole therapy in hepatic hydatidosis: a prospective, randomized study. Gastroenterology. 1993;104(5):1452-9
18. Ustunsoz B, Akhan O, Kamiloğlu MA, et al. Percutaneous treatment of hydatid cysts of the liver: long-term results. AJR Am J Roentgenol 1999; 172(1):91-6
19. Khuroo MS, Wani NA, Javid G ve ark. Percutaneous drainage compared with surgery for hepatic hydatid cysts. N Engl J Med 1997:25; 337(13):881-7
20. Brunetti E, Troia G, Garlaschelli AL, Gulizia R, Filice C. Twenty years of percutaneous treatments for cystic echinococcosis: a preliminary assessment of their use and safety. Parassitologia. 2004;46(4):367-70
21. Junghanss T, da Silva AM, Horton J, Chiodini PL, Brunetti E. Clinical management of cystic echinococcosis: state of the art, problems, and perspectives. Am J Trop Med Hyg. 2008;79(3):301-11
22. Kabaalioğlu A, Ceken K, Alimoglu E, Apaydin A. Percutaneous imaging-guided treatment of hydatid liver cysts: do long-term results make it a first choice? Eur J Radiol. 2006;59(1):65-73
23. Giorgio A, Di Sarno A, de Stefano G, Liorre G, Farella N, et al. Sonography and clinical outcome of viable hydatid liver cysts treated with double percutaneous aspiration and ethanol injection as first-line therapy: efficacy and long-term follow-up. AJR Am J Roentgenol. 2009;193(3):W186-92
24. Schipper HG, Laméris JS et al. Percutaneus evacuation (PEVAC) of multivesicular echinococcal cysts with or without cystobiliary fistulas which contain non-drainable material: first results of a modified PAIR method. Gut 2002;50:718-723
25. Akhan, O., Üstünsöz, B., Somuncu, İ., Özmen, M.N., Alemdaroğlu, et al. Percutaneous renal hydatid cyst treatment: long-term results. Abdom. Imaging 1988;23, 209–213
26. Akhan O, Koroglu M. Hydatid disease of the spleen. Semin Ultrasound CT MR. 2007;28(1):28-34
27. Akhan, O., Akkaya, S., Dağoğlu, M.G., Akpınar, B., Erbahçeci, A., et al. Percutaneous treatment of splenic cystic echinococcosis: results of 12 cases. Cardiovasc. Intervent. Radiol. 2016;39, 441–446
28. Akhan, O., Canyigit, M., Kaya, D., Koksal, A., Akgoz, A., Yucesoy, C., Akinci, D. Long-term follow-up of the percutaneous treatment of hydatid cyst in the adrenal gland: A case report and review of the literature. Cardiovasc. Intervent. Radiol. 2011;34, Suppl. 2, 256–959
29. Akhan, O., Ensari, S., Ozmen. Percutaneous treatment of a parotid gland hydatid cyst: a possible alternative to surgery. Eur Radiol. 2002;12, 597–599
30. Akhan, O., Bilgiç, S., Akata, D., Kıratlı, H., Özmen, M.N. Percutaneous treatment of an orbital hydatid cyst: a new therapeutic approach. Am. J. Ophthalmol. 1998;125, 877–879
31. Akhan, O., Ozmen, M.N., Dincer, A., Göçmen, A., Kalyoncu, F. Percutaneous treatment of pulmonary hydatid cysts. Cardiovasc Intervent Radiol. 1994;17, 271–275
32. Akhan, O., Dinçer, A., Saatçi, I., Gülekon, N., Besim, A. Spinal intradural hydatid cyst in a child. Br. J. Radiol. 1991;64, 465–466

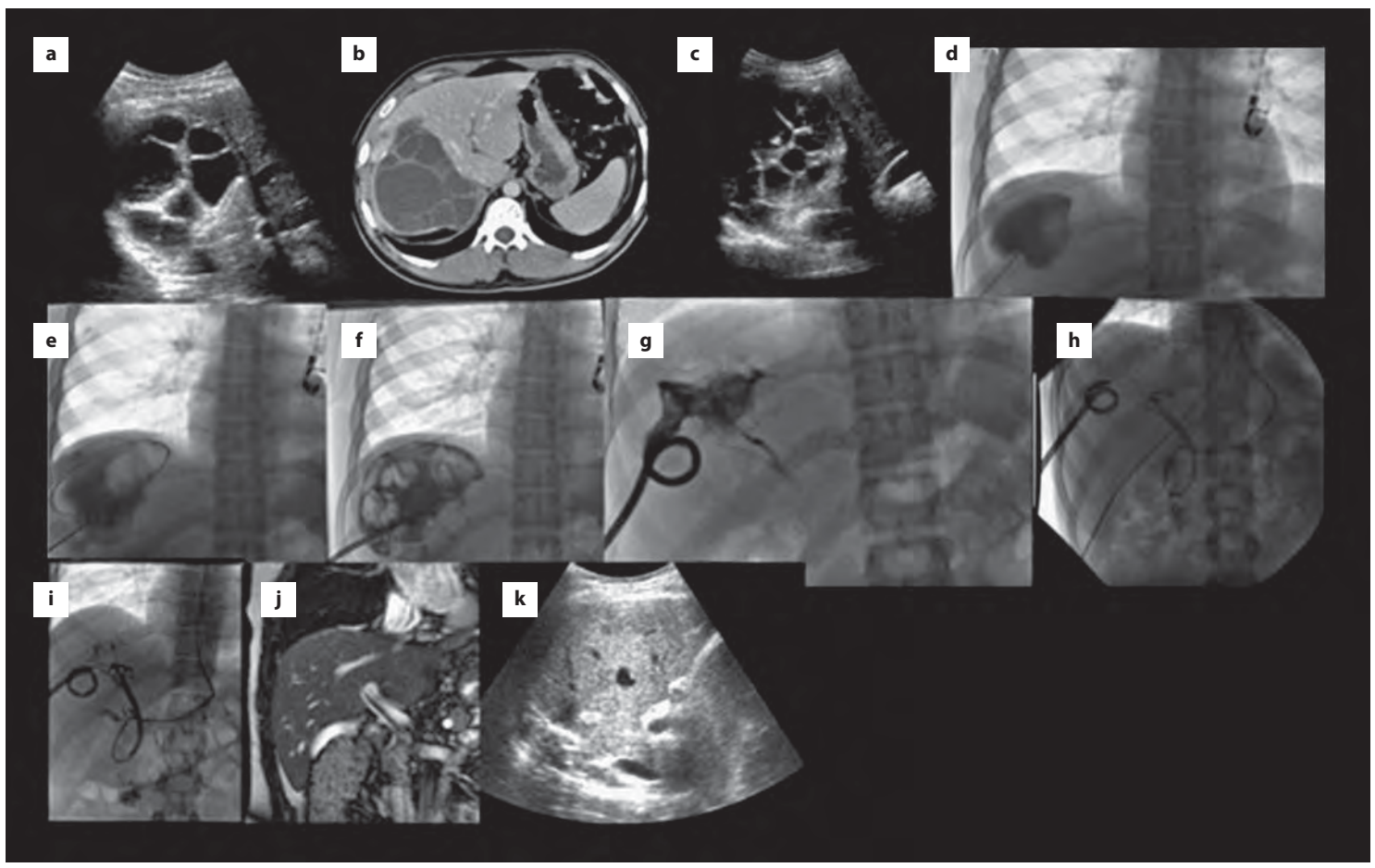


*Fig 2: CE2 cyst was detected on abdominal US **(a)** and CT **(b)** examination of the 30-year-old male patient. Percutaneous treatment was performed by MoCaT technique. Puncture was performed with an 18-G Seldinger needle under US guidance **(c)**. Contrast media was then injected into the cavity **(d)**. A 0.035-inch Amplatz guide-wire was advanced under the fluoroscopy guidance **(e)**. After tract dilatation, a 14 Fr pigtail 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 the 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)**.*

Thanks to the EU grant FP7/2007-2013, No. 602051 – HERACLES

A Brief History of IR in Denmark

Poul Erik Andersen, EBIR

Poul Erik Andersen
(EBIR)
University of Southern Denmark
Odense, Denmark

Poul Erik Andersen received his medical degree from the University of Southern Denmark, Odense in 1974, and passed the Educational Council for Foreign Medical Graduates in 1975. He was certified as a specialist in radiology in 1982. Since 1983, Dr. Andersen has been Chief Radiologist/Consultant of the Department of Radiology, Cardiovascular Section at Odense University Hospital. His expertise is primarily in vascular interventions where he has introduced and developed many procedures. His significant experience and extensive scientific work has led to many posts in the Danish Society of Interventional Radiology and the European Society of Radiology. He is a fellow of CIRSE and an EBIR holder. Prof. Andersen is this year's Local Host Committee Chairperson.

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

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 Seldinger 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 sterilised 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 specialisation 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 (DFIR) www.dfir.dk 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 DFIR, of which six are EBIR holders and four are CIRSE Fellows. The engagement in CIRSE has risen gradually over the years, with DFIR 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 EBIR 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 DFIR who are reviewers for *CVIR* 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:

Graft limb complications in endovascular aortic repair
Ph.D thesis, University of Copenhagen, 2015 [1]

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

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
Ph.D thesis, University of Copenhagen, 2017 [10]

Uterine fibroid embolization – Long-term follow-up and technical perspectives
Ph.D thesis, University of Southern Denmark, 2017 [11-14]

Spinal embolization - Preoperative embolization in surgical treatment of metastatic spinal cord compression
Ph.D. thesis, University of Copenhagen, 2015 [15,16]

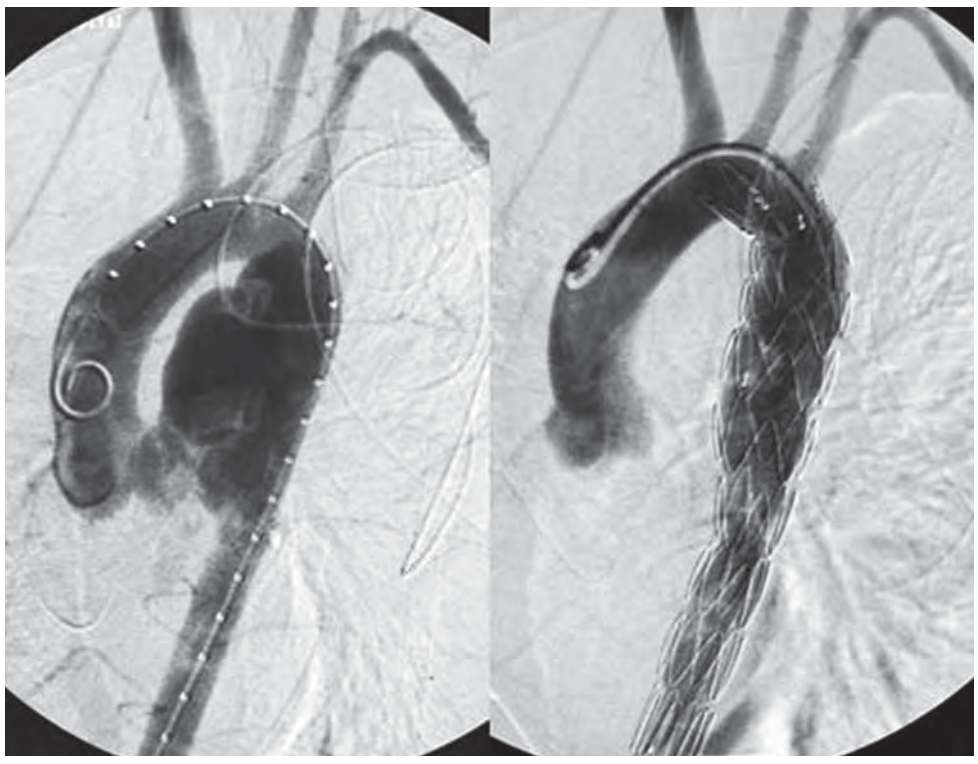


Fig. 1

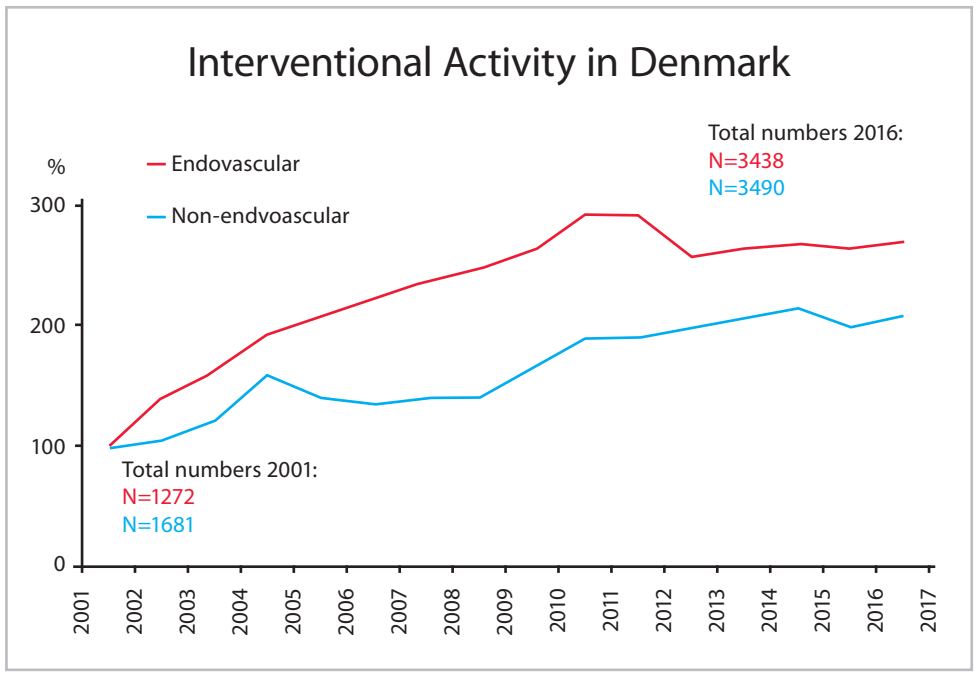


Fig. 2

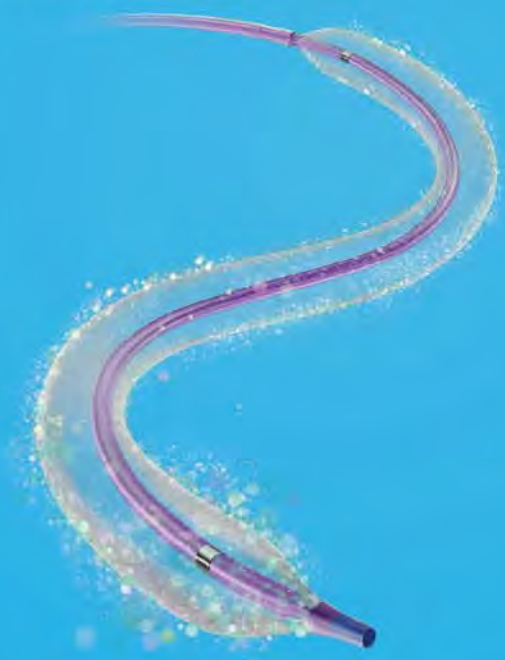
References:

1. Taudorf M, Rasmussen JBG, Schroeder T, Lönn L. Endovascular Aneurysm Repair Treatment of Aortoiliac Aneurysms: Can Iliac Branched Devices Prevent Gluteal Claudication? JVIR 2016;27(2):174-80
2. Duvnjak S. Endovascular Management of Type I Endoleak with Fenestrated Aortic "Cuff" and Afterwards Treatment of Endoleak Type III. Internat J Angiol 2016. http://dx.doi.org/10.1055/s-0034-15441262015
3. Duvnjak S. Endovascular treatment of aortoiliac aneurysms: From intentional occlusion of the internal iliac artery to branch iliac stent graft. World J Radiol 2016;8(3):275-80
4. Bredahl KK, Taudorf M, Lönn L, Vogt KC et al. Contrast Enhanced Ultrasound can Replace Computed Tomography Angiography for Surveillance After Endovascular Aortic Aneurysm. Eur J Vasc Endovasc Surg 2016;52(6):729-34
5. Duvnjak S, Andersen PE, Larsen KE, Roeder O. Endovascular repair of postoperative vascular graft related complications after aorto-iliac surgery. Internat Angiology 2014;33:386-391
6. Strøm M, Lönn L, Bech B, Schroeder TV, Konge L and 32 collaborators. "EVARATE Delphi Panel". Assessment of Competence in EVAR Procedures: A Novel Rating Scale Developed by the Delphi Technique. Eur J Vasc Endovasc Surg. 2017 Jul;54(1):34-41. doi: 10.1016/j.ejvs.2017.04.001
7. Duvnjak S, Balezantis T, Lindholt JS. Low mortality and morbidity after endovascular repair of ruptured aortic aneurysm. Dan Med J. 2015 Sep;62(9). pii: A5130 Dencker D, Taudorf M, Luk NHV, Nielsen MB et al. Frequency and Effect of Access-Related Vascular Injury and Subsequent Vascular Intervention After Transcatheter Aortic Valve Replacement. Amer J Cardiol 2016;118(8):1244-50
8. De la Motte LR, Vogt K, Jensen LP, Rasmussen JBG et al. Incidence of systemic inflammation response syndrome after endovascular aortic repair . J Cardiovasc Surg 2011;52:73-79
9. De la Motte LR, Jensen LP, Vogt K et al. Outcomes after elective aortic aneurysm repair. A nationwide Danish cohort study 2007-2010. Europ J Vasc Endovasc Surg 2013;46:57-64
10. Dencker D, Taudorf M, Luk NHV, Nielsen MB et al. Frequency and Effect of Access-Related Vascular Injury and Subsequent Vascular Intervention After Transcatheter Aortic Valve Replacement. Amer J Cardiol 2016;118(8):1244-50
11. Duvnjak S, Ravn P, Green A, Andersen PE. Magnetic Resonance Signal Intensity Ratio Measurement Before Uterine Artery Embolization: Ability to Predict Fibroid Size Reduction. Cardiovasc Intervent Radiol. DOI: 101007/s00270-017-1721-2
12. Duvnjak S, Ravn P, Green A, Andersen PE. Uterine fibroid embolization with acrylamide polyvinyl microspheres: prospective 12-months clinical and MRI follow-up study. Acta Radiol 2016, doi: 10.1177/0284185116679458
13. Duvnjak S, Ravn P, Green A, Andersen PE. Clinical Long-Term Outcome and Reinterventional Rate After Uterine Fibroid Embolization with Nonspherical Versus Spherical Polyvinyl Alcohol Particles. Cardiovasc Intervent Radiol 2016;39:209. DOI 10.1007/s00270-015-1157-5
14. Dueholm M, Langfeldt S, Mafi HM et al. Re-intervention after uterine leiomyoma embolization is related to incomplete infarction and presence of submucous leiomyomas. Eur J Obstet Gynecol Reprod Biol 2014;178:100-6
15. Clausen C, Dahl B, Frevert S et al. Inter- and intra-rater agreement in the assessment of the vascularity of spinal metastases using digital subtraction angiography tumor blush. Acta Radiol 2017. Doi.org/10.1177/0284185116668215
16. Clausen C, Dahl B, Frevert SC et al. Preoperative embolization in surgical treatment of spinal metastases: single-blind, randomized controlled clinical trial of efficacy in decreasing intraoperative blood. JVIR 2015;26(3):402-12

HOW DO YOU EXTEND TIME **TO RE-INTERVENTION** IN AV ACCESS?

Fortrex™
0.035" OTW PTA Balloon Catheter

4-12 MM DCBS
NOW AVAILABLE!



IN.PACT™ Admiral™
Drug-Coated Balloon

SYMPOSIUM

Auditorium 3

Optimizing treatment outcomes in complex vascular disease with DCB combination therapy

Sunday 17 September, 11:30-12:30

IN.PACT™ DCB is changing the first line therapy for the treatment of complex SFA disease	**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	**M. Treitl**

LEARNING CENTER

Medtronic Booth, Exhibit Hall

Please reserve your spot by scanning the QR code or by registering on:
http://bit.ly/MedtronicCIRSE2017

Saturday 16 September, 14:00
Tuesday 19 September, 12:45

Hands-on atherectomy training	**M. Treitl**

Sunday 17 September, 12:45
Monday 18 September, 12:45

Extending the life of dialysis AV access: lessons learned in using DCBs	**K. Katsanos**

Medtronic
Further, Together

Don't miss it !
Amazing Interventions
Special Session
Sunday, September 17, 16:15 -17:15
Auditorium 1

My Amazing Interventions

Florian Wolf, EBIR

Florian Wolf
(EBIR)
Medical University of Vienna
Vienna, Austria

Assoc. Prof. Dr. Florian Wolf is Vice-Director of the Division of Cardiovascular and Interventional Radiology at the Medical University of Vienna, where he completed his medical education in 2000. He later became a board-certified radiologist in 2008 and, subsequently, a holder of the EBIR certification. As well as authoring or co-authoring over 40 publications, Dr. Wolf is on the editorial board of the European Radiology journal. An active member and Fellow of CIRSE, he is a member of the CIRSE Endovascular Subcommittee and has served on CIRSE's Clinical Practice App Task Force and the ESIRonline Editorial Board.

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 aneurysm 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 haematoma around the abdominal aorta and a projectile adjacent to the aorta, which showed a small "tail" in the direction of the haematoma (Fig. 1a). The working hypothesis was a penetration of the aorta by the projectile. The patient was transferred to the angio suite in a good clinical condition. Diagnostic angiography showed a huge hole in the aorta, which I closed successfully and quickly by percutaneous implantation of an aortic tube graft in the distal thoracic aorta proximal to the coeliac trunk. The patient became more and more unstable, and I encountered a pericardial tamponade by ultrasound with no more regular left ventricular contraction (Fig. 1b). We started cardiac massage, and a few minutes later, cardiac surgeons made an emergency thoracotomy and closed a large hole in 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 ischaemia. Emergency CT-angiography showed an acute aortic dissection with signs of a pneumatosis and necrotic parts of the intestine (Fig. 1c). Our interdisciplinary team decided to try a three-step procedure in the angio suite: as a first step, I 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.

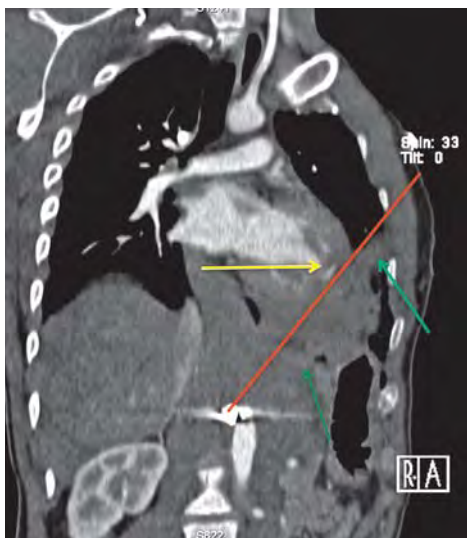


Fig. 1a: Bullet channel through the lung, the left ventricle, the stomach and the aorta.

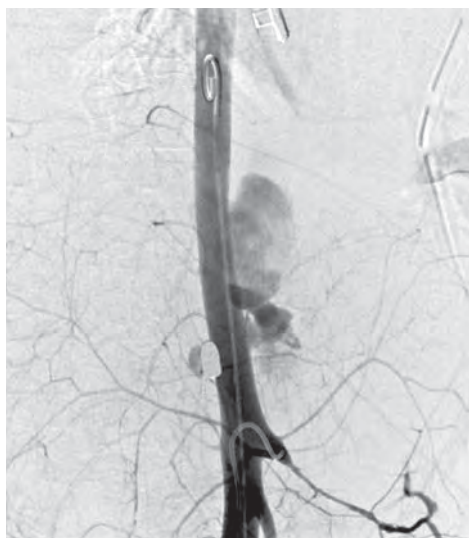


Fig. 1b: Angiography of the aorta showing the large hole in the aorta with active contrast media extravasation.

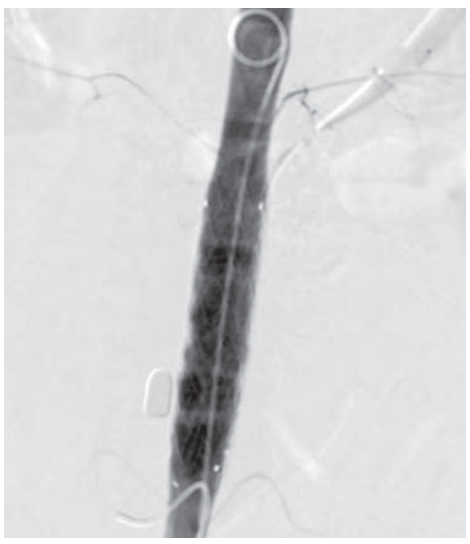


Fig. 1c: Angiography after tube graft implantation.

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 CIRSE'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 IR 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 service 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 Akira 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.

Take part in the CVIR selfie contest. For more info, visit www.facebook.com/cvirjournal

CVIR "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 3. 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 juxtarenal 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 Osirix 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.

Participating physicians 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.

Endologix Technical Forum
Monday, September 18 | 14:30 – 16:00

Deeply committed to solving the most challenging problems in aortic therapy, Endologix 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, learning 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.

Don't miss the Endologix Industry Symposium!
Monday, September 18 | 13:30 – 14:00
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.

Philips Volcano
IVUS-guided EVAR/TEVAR procedures
Tuesday, September 19 | 14:00-15:00

Philips Volcano's first workshop will be dedicated to its Digital IVUS Technology in EVAR/TEVAR procedures. Through hands-on experience on a flow model, participants will be able to improve technical and procedural skills and learn how IVUS-guidance can reduce contrast and radiation exposure in EVAR/TEVAR procedures. After an introduction covering the procedural steps, recorded case-examples will be shown, followed by hands-on practice on a flow model with real-time measurements.

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.

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 importance on a global scale, interventional oncology 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.

ecco European CanCer Organisation

Bone tumours and combined therapy: when and how?

Lambros Tselikas, Thierry de Baère 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 also 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 haemangiomas [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 frequented 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 techniques 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.

Don't miss it!

Treatment options for bone tumours
Special Session
Sunday, September 17, 08:30- 09:30
Auditorium 15

Lambros Tselikas
Gustave Roussy
Villejuif, France

Dr. Lambros Tselikas received his medical degree at the Université Pierre et Marie Curie, specialising in radiology at the Université René Descartes. Since 2014, he has been an interventional radiologist at Gustave Roussy, one of the world leading centres for cancer where he also completed a residency. He has been on the Faculty for the European Conference on Interventional Oncology, speaking on immunotherapy. Co-author Thierry de Baère heads the IR team at the Gustave Roussey Centre; Frederic Deschamps is also a team member, alongside Dr. Tselikas, and is renowned for his pioneering work in cancer-related bone consolidation.

References:
1. Woodward E, Jagdev S, McParland L, et al. (2011) Skeletal complications and survival in renal cancer patients with bone metastases. Bone, 48(1):160-166
2. Bonetto R, Tallet A, Melot A, Calderon B, Barlesi F (2017) [The management of bone metastasis]. Bull Cancer, 104(6):585-592
3. Deschamps F, Farouil G, de Baere T (2014) Percutaneous ablation of bone tumors. Diagn Interv Imaging, 95(7-8):659-663
4. Deschamps F, Farouil G, Ternes N, et al. (2014) Thermal ablation techniques: a curative treatment of bone metastases in selected patients? Eur Radiol, 24(8):1971-1980
5. Weichselbaum RR, Hellman S (2011) Oligometastases revisited. Nature reviews. Clinical oncology, 8(6):378-382
6. Premat K, Clarencon F, Cormier E, et al. (2017) Long-term outcome of percutaneous alcohol embolization combined with percutaneous vertebroplasty in aggressive vertebral hemangiomas with epidural extension. Eur Radiol, 27(7):2860-2867
7. Goetz MP, Callstrom MR, Charboneau JW, et al. (2004) Percutaneous image-guided radiofrequency ablation of painful metastases involving bone: a multicenter study. J Clin Oncol, 22(2):300-306
8. Di Staso M, Gravina GL, Zugaro L, et al. (2015) Treatment of Solitary Painful Osseous Metastases with Radiotherapy, Cryoablation or Combined Therapy: Propensity Matching Analysis in 175 Patients. PLoS One, 10(6):e0129021
9. Kurup AN, Callstrom MR (2017) Expanding role of percutaneous ablative and consolidative treatments for musculoskeletal tumours. Clin Radiol, 72(8):645-656
10. Bai H, Gao P, Gao H, et al. (2016) Improvement of Survival Rate for Patients with Hepatocellular Carcinoma Using Transarterial Chemoembolization in Combination with Three-Dimensional Conformal Radiation Therapy: A Meta-Analysis. Med Sci Monit, 22:1773-1781

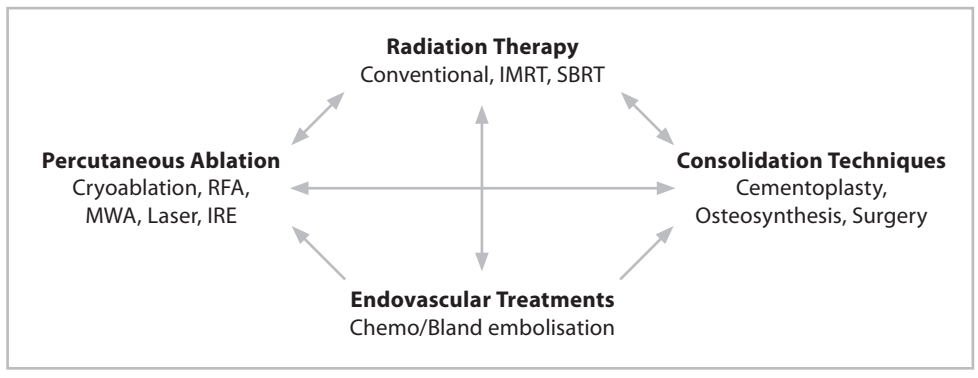


Fig. 1: Therapeutic options and combinations for locoregional treatments of bone tumours.

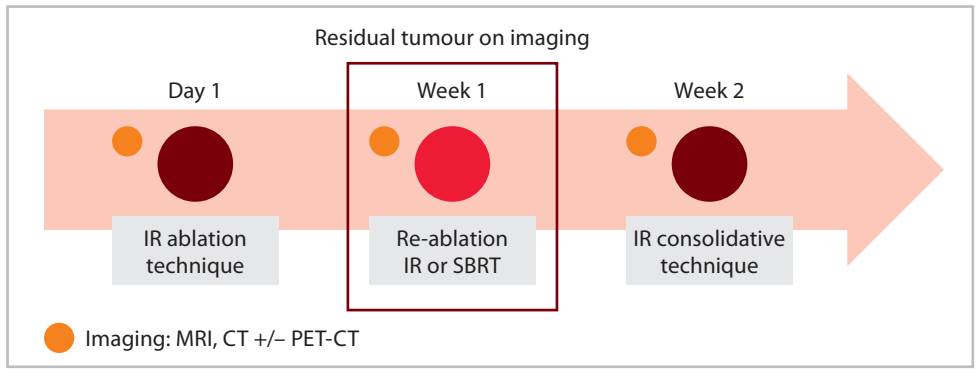


Fig. 2: Time-lapse of combined ablative and consolidative techniques in clinical practice.

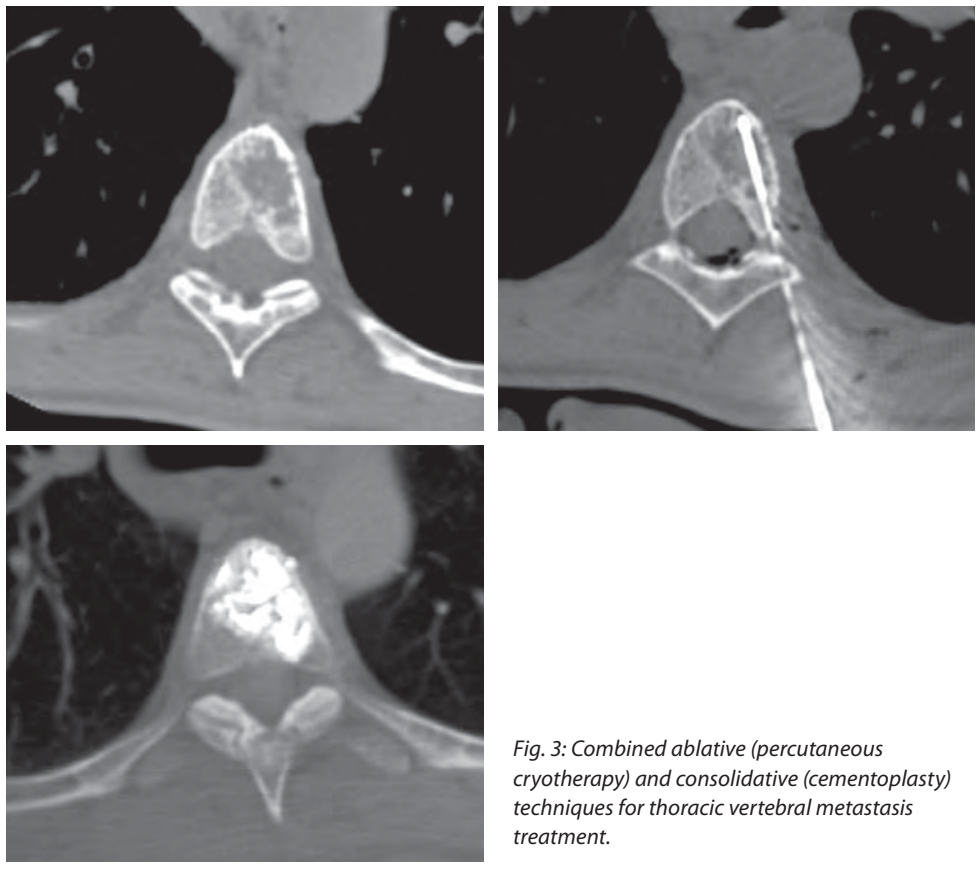


Fig. 3: Combined ablative (percutaneous cryotherapy) and consolidative (cementoplasty) techniques for thoracic vertebral metastasis treatment.

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)

IVC Filters: So Simple, Yet So Complicated

John Kaufman, EBIR

Don't miss it !
IVC filter
Expert Round Table
Sunday, September 17, 08:30-09:30
Auditorium 1

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 utilisation [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 utilisation 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 inflection point appearing to have occurred in 2012 [6,7].

The increased awareness of IVC filter complications appears to have had an influence on referring physicians, regarding placement of these devices. The impact of reporting bias is difficult to determine, but, over time, IVC filter articles have increasingly focused on complications, as seen through the growing number of articles. A search of IVC filter articles in PubMed from 1/1/2000 to 6/16/2017 revealed that 57% included the term "complications", compared to only 43% of filter articles between 1985 and 2000. Over the two time periods, there was an almost 600% increase in the overall number of filter articles. FDA MAUDE reports on device complications reveal a disproportionate representation of retrievable IVC filters compared to permanent devices [8]. This leads to an important question: did the actual incidence of IVC filter complications increase, or are more complications being seen because filters are being used more now than 20 years ago?

The general level of uncertainty about vena cava filters is now extremely high in the medical community. The current state of knowledge about IVC filters has been termed a "data desert", in which there is not enough evidence to justify the use of IVC filters [2]. Indeed, there have been few randomised prospective trials involving IVC filters. The two most often cited are the PREPIC (Prevention du Risque d'Embolie Pulmonaire par Interruption Cave) I and II trials [9,10]. In both trials, 400 patients with documented VTE, who could all be safely anticoagulated, were randomised to either anticoagulation alone (control group) or to receive an additional permanent filter (PREPIC I) or an additional retrievable filter (PREPIC II) (treatment groups). In PREPIC I there were data that filters provide an early protection from symptomatic recurrent PE. Although protection from all recurrent PE was demonstrated in this study, there was no long-term survival benefit [10]. This resulted in the PREPIC II trial, in which retrievable ALN filters were utilised to try to capitalise on the early protection from recurrent PE; however, the recurrent PE rate was surprisingly low in the control group. As a result, the treatment group derived no benefit from the IVC filters and was subjected to more procedures (IVC filter removals) [9]. However, neither study utilised filters as they are most commonly employed in clinical practice – as an alternative to anticoagulation. Despite the laudable trial designs (randomised, prospective), these studies do not help us answer many of the current questions about these devices. Hopefully, the Cook CIVC and SIR/SVS PRESERVE trials will provide some of these answers.

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 not clinical equipoise regarding the link between DVT and PE, the link between PE and morbid 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 morbid and/or lethal PE in the absence of anticoagulation [10,11].

The overall decrease 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. Adient Medical has a polydioxanone device that retains filtration integrity for as long as 10 weeks but can be completely absorbed (Fig.3) [15]. This device is in 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.

John Kaufman
(EBIR)
Chair, Department of Interventional Radiology, and Director, Dotter Interventional Institute
Portland, Oregon, USA

Dr. Kaufman is Director of the Dotter Institute and past President of the Society of Interventional Radiology. His clinical interests include aortic aneurysms, venous diseases, vascular malformations and image-guided treatment of liver cancers and uterine fibroids. He is also actively involved in clinical research in these areas and has received numerous awards and honours, including a United States Public Health Service Achievement Medal, a Figley Fellowship in Radiology Journalism with the American Roentgen Ray Society (ARRS) and a Distinguished Alumnus Award from Boston University School of Medicine. Dr. Kaufman is a Fellow of CIRSE, SIR, and the Council of Cardiovascular Radiology and Intervention of the AHA.

References:
1. Trendlenberg, F., Über die chirurgische Behandlung der puerperalen Pyaemie Munchen Med Wschr, 1912
2. Bikdeli, B., J.S. Ross, and H.M. Krumholz, Data Desert for Inferior Vena Caval Filters: Limited Evidence, Supervision, and Research. JAMA Cardiol, 2017. 2(1): p. 3-4
3. Wang, S.L. and A.J. Lloyd, Clinical review: inferior vena cava filters in the age of patient-centered outcomes. Ann Med, 2013. 45(7): p. 474-81
4. Bikdeli, B., et al., Vena Caval Filter Utilization and Outcomes in Pulmonary Embolism: Medicare Hospitalizations From 1999 to 2010. J Am Coll Cardiol, 2016. 67(9): p. 1027-35
5. Brown, J.D. and J.C. Talbert, Variation in the Use of Vena Cava Filters for Venous Thromboembolism in Hospitals in Kentucky. JAMA Surg, 2016. 151(10): p. 984-986
6. Desai, S.S., et al., Impact of consensus statements and reimbursement on vena cava filter utilization. J Vasc Surg, 2016. 64(2): p. 425-429
7. Glocker, R.J., et al., Bundling of Reimbursement for Inferior Vena Cava Filter Placement Resulted in Significantly Decreased Utilization between 2012 and 2014. Ann Vasc Surg, 2017. 38: p. 172-176
8. Angel, L.F., et al., Systematic review of the use of retrievable inferior vena cava filters. J Vasc Interv Radiol, 2011. 22(11): p. 1522-1530.e3
9. Mismetti, P., et al., Effect of a retrievable inferior vena cava filter plus anticoagulation vs anticoagulation alone on risk of recurrent pulmonary embolism: a randomized clinical trial. Jama, 2015. 313(16): p. 1627-35
10. Eight-year follow-up of patients with permanent vena cava filters in the prevention of pulmonary embolism: the PREPIC (Prevention du Risque d'Embolie Pulmonaire par Interruption Cave) randomized study. Circulation, 2005. 112(3): p. 416-22
11. Stein, P.D. and F. Matta, Vena cava filters in hospitalised patients with chronic obstructive pulmonary disease and pulmonary embolism. Thromb Haemost, 2013. 109(5): p. 897-900
12. Bio2Medical. [cited 2017 June 18]; Available from: https://bio2medical.com/
13. Tapson, V.F., et al., Evaluation of a Device Combining an Inferior Vena Cava Filter and a Central Venous Catheter for Preventing Pulmonary Embolism Among Critically Ill Trauma Patients. J Vasc Interv Radiol, 2017
14. Medical, N. [cited 2017 June 18]; Available from: http://www.seroba-lifesciences.com/novate/.
15. Eggers, M.D., et al., Pilot in vivo study of an absorbable polydioxanone vena cava filter. J Vasc Surg Venous Lymphat Disord, 2015. 3(4): p. 409-20

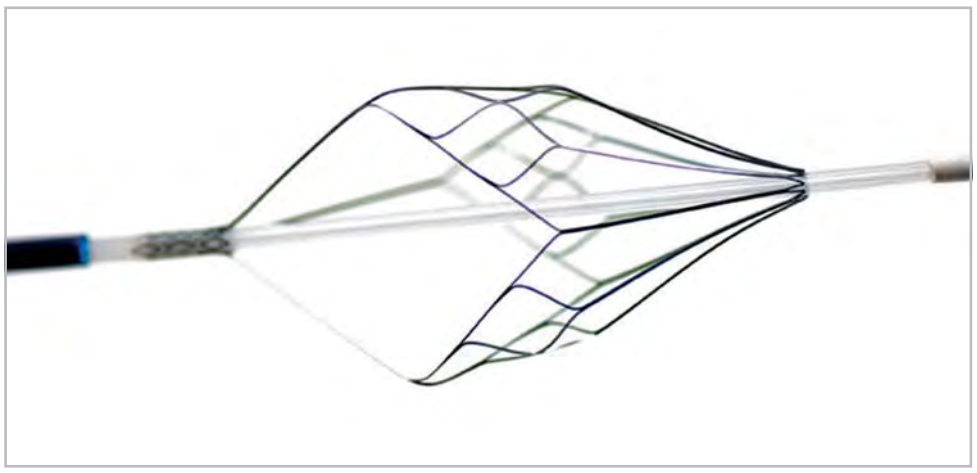


Fig. 1: The Angel Catheter (courtesy of Bio2 Medical).

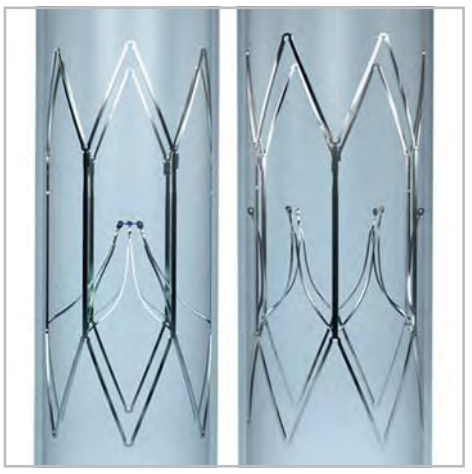


Fig. 2: The Sentry Filter (courtesy of Novate Medical).

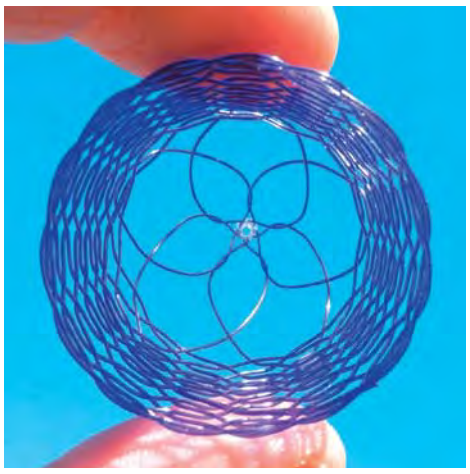


Fig. 3: The Adient Medical Filter (courtesy of Adient Medical).

ECIO 2018

European Conference on Interventional Oncology

April 22-25
Vienna, Austria

www.ecio.org

SUBMIT YOUR ABSTRACTS

LEADERS IN ONCOLOGIC INTERVENTIONS

CIRSE

Cardiovascular and Interventional Radiological Society of Europe

Sirflox and Foxfire: latest global results

Thomas Helmberger, EBIR

Don't miss it !
Radioembolisation: results and new perspectives
Special Session
Sunday, September 17, 08:30-09:30
Auditorium 10

Thomas K. Helmberger
(EBIR)
Klinikum Bogenhausen
Munich, Germany

Prof. Thomas Helmberger is Head of the Institute for Diagnostic and Interventional Radiology, Neuroradiology and Nuclear Medicine at the Klinikum Bogenhausen in Munich, and Deputy Director of its Oncology Centre. A founding member of the German Society for IR (DeGIR), he is also an active CIRSE member: as well as contributing regularly as a faculty member, he acted as Co-Chairperson of CIRSE 2012 in Munich, a congress noted for its hugely successful press coverage and student programme, largely thanks to his energetic efforts. He has also lent his oncological knowledge to the ECIO conference, serving as Deputy Chairperson of the Programme Committee from 2014-2015, and as Chairperson the following 2 years.

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 exhibit 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 first-line therapies in metastatic CRC are folinic acid, fluorouracil and oxaliplatin (FOLFOX) or irinotecan (FOLFIRI) +/- biological drugs targeting specific humoral factors (VGEF, EGFR) or tumour cells with gene mutations (e.g. RAS, BRAF) [2].

The encouraging results of the combination of systemic chemotherapy (CTx) and radioactive microspheres (SirSpheres® Sirtex Medical Australia), which have been achieved since the mid-1990s in salvage, first- and second-line therapies gave rise to three large trials designed to evaluate the efficacy of a modern chemotherapy regimen (FOLFOX +/– antibodies), plus radioembolisation (RE) (Table 1).

In the interim analysis of the SIRFLOX data in 2015, there was a significant benefit of the combination therapy, with 7.9 months improvement in median progression-free survival in the liver (12.6 vs. 10.5 months, p 0 0.002) [4]. Surprisingly, the hypothesis of an improved survival by chemotherapy plus radioembolisation, in comparison to chemotherapy alone, could not be confirmed in the end. Moreover, even if the liver-specific progression-free survival mirrored the interim results (HR 0.51; p <0.001) and the best radiological response was clearly in favour of the combination therapy (HR 1.52; p <0.001), extrahepatic progression or death was increased significantly in the combination treatment arm (HR 1.76; p <0.001). Subsequently, the median survival and the progression-free survival in both treatment arms was statistically similar (Table 3). Nevertheless, subgroup analysis – as far as available – revealed some interesting differences. Even without statistical significance, less liver involvement (<25% of hepatic volume), female gender, and no primary tumour in situ tended in favour of chemotherapy plus radioembolisation. Furthermore, the combination treatment decreased the risk of death by 36% and significantly improved the median overall survival of patients with right-sided colon tumours by 4.9 months (HR 0.64; p = 0.007), supporting the not-yet-fully-understood fact that right-sided colon cancer behaves biologically differently to left-sided.

There was also a slight tendency towards higher hepatic resection rates in patients treated by radioembolisation, as already observed in prior and current studies [5].

SIRFLOX, FOXFIRE and FOXFIRE global were initiated with enthusiasm and with the expectation that adding RE to a modern chemotherapy regimen might improve patients' outcomes. These expectations were not met. However, the presented studies also illustrate how study design and patient selection may influence results. On average, patients with colorectal cancer at stage IV present synchronous hepatic metastases in 15–25%, with 70–80% of these metastases limited to the liver [6,7]; in the three presented studies, the rate of synchronous metastases was about 87%. Additional extrahepatic disease and the primary tumour still in situ (about 35% and 50–55% in the presented three studies) are negatively affecting overall survival significantly, as just recently shown by a nationwide population-based propensity score-adjusted study in the Netherlands [8]. In consequence, the disproportionately high rate of advanced stage IV patients in the presented studies might explain that the significantly improved interim 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 the SIRFLOX, FOXFIRE and FOXFIREglobal trial [3]

	SIRFLOX	FOXFIRE	FOXFIREglobal
Study type	Randomised comparative trial of FOLFOX6m +/- bevacizumab/cetuximab plus SIR-Spheres microspheres versus FOLFOX6m +/- bevacizumab/cetuximab alone as first-line treatment in patients with non-resectable liver metastases from primary colorectal carcinoma		
Geographic region	ANZ, EME, USA	UK	ANZ, AP, EME, USA
Recruitment completed	2013	2014	2014
Patients	530	364	209
Eligibility criteria	• Adenocarcinoma of the colon or rectum • Liver metastases not surgically resectable or ablatable • Eligible for systemic chemotherapy as first-line treatment for metastatic CRC • WHO Performance Status 0–1 • Limited extra-hepatic metastases • Permitted to have primary tumour in situ • No evidence of ascites, cirrhosis, portal hypertension		
Study endpoints	**Primary** • Overall survival (time from randomisation to all-cause death) **Secondary** • PFS at any site (independent central imaging review) • Liver-specific PFS (independent central imaging review) • Objective tumour response rate at any site (RECISTv1.0) • Hepatic resection rate • Toxicity & safety (NCICTCAE v 3.0) • Health-related quality of life		

Table 2: Patients' characteristics [3]

	FOLFOX +/– bevacizumab/cetuximab	FOLFOX +/– bevacizumab/cetuximab + Sir-Spheres®
Number of patients	540	554
Median age (years, range)	63 (23-89)	63 (28-90)
Male/female (%)	65.8/34.2%	65.5/34.5%
Performance status (WHO 0/1)	63.2/36.4%	63.9/35.7%
Intent to treat with biologicals	54.5%	53.8%
Primary TU in situ	55.0%	50.2%
Synchronous metastases	86.5%	87.2%
Hepatic involvement <25%	30.6%	32.3%
Extrahepatic metastases	34.8%	35.9%
Type of CTx regimen		
• Intended dose of CTx	FOLFOX 85 mg	initially 3 x FOLFOX 60 mg
• Median number of cycles of FOLFOX	12 (7–13)	12 (7–15)
• Full dose of FOLFOX	49.1% from the beginning	43.8% after 3rd CTx cycle
• Bevacizumab/cetuximab	46.6%	35.6%
• Patients with bevacizumab	1.6%	0.7%
• Patients with cetuximab	74%	67.9%
• Subsequent chemotherapy (p = 0.026)		

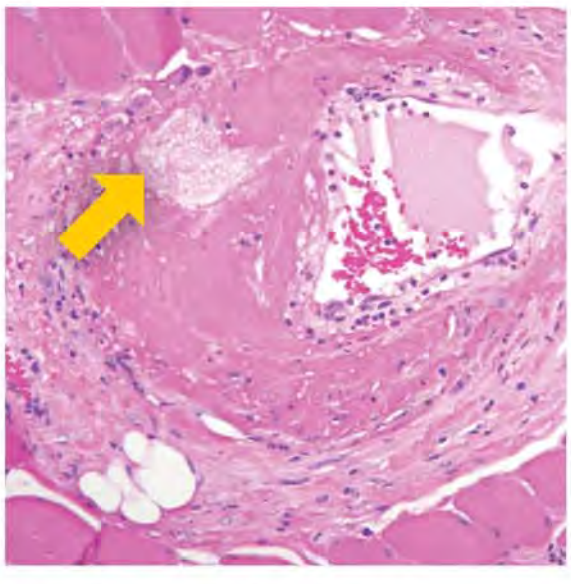
Table 3: Summary results [3]

	FOLFOX +/– bevacizumab/cetuximab	FOLFOX +/– bevacizumab/cetuximab + Sir-Spheres®
Median overall survival (HR 1.04; p = 0.609)	23.3 months	22.6 months
Progression-free survival (HR 0.90; p = 0.108)	10.3 months	11.0 months
Adverse events		
– All patients grade ≥ 3	66.5%	74%
• Neutropenia	24.2%	36.7%
• Thrombocytopenia	1.2%	7.7%
• Leukopenia	2.3%	5.9%
• Fatigue	4.9%	8.5%
• Abdominal pain	2.3%	6.1%
• Peripheral neuropathy	5.8%	3.6%

References:
1. Landreau P et al. Incidence and survival in late liver metastases of colorectal cancer. J Gastroenterol Hepatol 2015; 30(1): 82-85
2. Van Cutsem E et al. ESMO consensus guidelines for the management of patients with metastatic colorectal cancer. Ann Oncol 2016; 27(8): 1386-1422
3. Sharma RA et al. Presented at 2017 ASCO Annual Meeting; J Clin Oncol 2017; 35 (Suppl): Abs 3507
4. van Hazel G.A et al. SIRFLOX: Randomized Phase III Trial Comparing First-Line mFOLFOX6 (Plus or Minus Bevacizumab) Versus mFOLFOX6 (Plus or Minus Bevacizumab) Plus Selective Internal Radiation Therapy in Patients With Metastatic Colorectal Cancer. J Clin Oncol 2016; 34(15): 1723-1731
5. Pardo F et al. The Post-SIR-Spheres Surgery Study (P4S): Retrospective Analysis of Safety Following Hepatic Resection or Transplantation in Patients Previously Treated with Selective Internal Radiation Therapy with Yttrium-90 Resin Microspheres. Ann Surg Oncol 2017
6. Adam R et al. Managing synchronous liver metastases from colorectal cancer: a multidisciplinary international consensus. Cancer Treat Rev 2015; 41(9): 729-741
7. Manfredi S et al. Epidemiology and management of liver metastases from colorectal cancer. Ann Surg 2006; 244(2): 254-259
8. 't Lam-Boer J et al. Palliative resection of the primary tumor is associated with improved overall survival in incurable stage IV colorectal cancer: A nationwide population-based propensity-score adjusted study in the Netherlands. Int J Cancer 2016; 139(9): 2082-2094

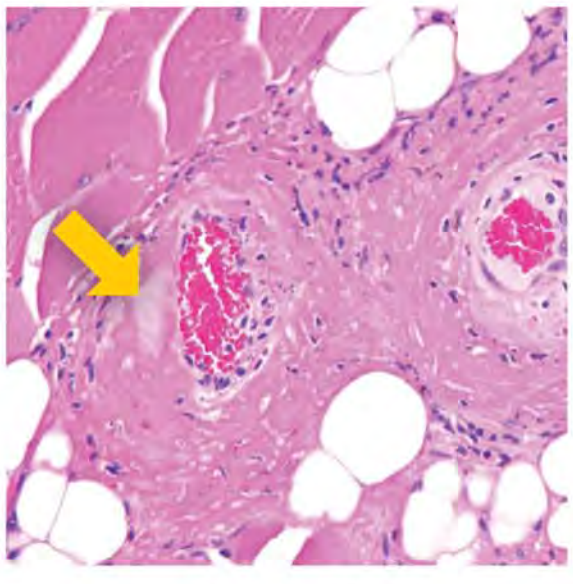
DID YOU KNOW?

PRE-CLINICAL TESTING SHOWED THREE DCBs PRODUCED DOWNSTREAM CRYSTALLINE MATERIAL.



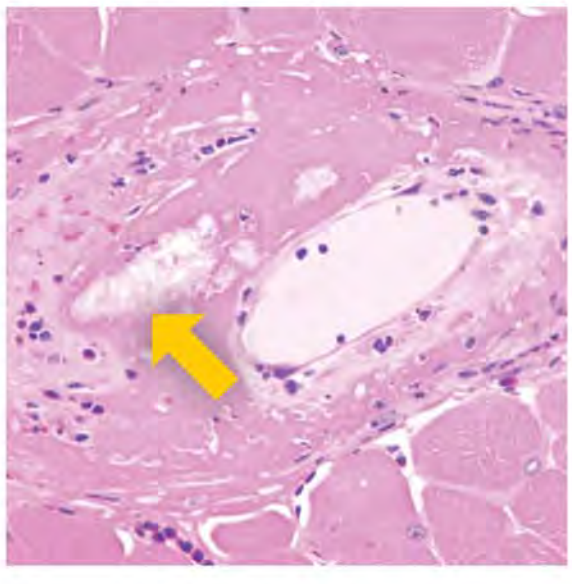
BCD BRAND 1

3.6-4.8%



BCD BRAND 2

2.4%



BCD BRAND 3

1.2%

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. 3X Balloons. Data on file, LUTONIX, Inc., New Hope, MN.

Advancing Lives and the Delivery of Health Care™

BARD

Preclinical results may not be indicative of clinical performance. Different test methods may yield different results.

The LUTONIX® 035 Drug Coated Balloon Catheter is intended for Percutaneous Transluminal Angioplasty (PTA) in the peripheral vasculature and for the treatment of obstructive lesions and decreasing the incidence of restenosis. In addition, the LUTONIX® 035 Drug Coated Balloon Catheter is intended for PTA of native dialysis fistulae or synthetic grafts, opening narrowing and immature fistulae, to improve blood flow, and decreasing the incidence of restenosis.

The LUTONIX® DCB Catheter is contraindicated for use in patients with a hypersensitivity to paclitaxel or paclitaxel related compounds, in women who are breastfeeding, pregnant or are intending to become pregnant and in men intending to father children. **Please consult Bard product labels and inserts for any indications, additional contraindications, hazards, warnings and instructions for use.**

Lutonix, Inc., a subsidiary of C. R. Bard, Inc., 9409 Science Center Drive | New Hope, MN 55428 USA | Tel: +1 763 445 2352 | Fax: +1 763 445 2353
Bard Ltd., Forest House, Brighton Road, Crawley | West Sussex, RH11 9BP, United Kingdom | Tel: +44 1293 527888 | Fax: +44 1293 552428 | www.lutonix.com LU/9004/0317/0091

CE 0086

Differences in drug carriers for coated balloon catheters (DCB)

Gunnar Tepe (EBIR), Daniel Peters-Berg, Ulrich Speck

Don't miss it !
Basics of drug-eluting technology
Fundamental Course
Sunday, September 17, 08:30-09:30
Auditorium 2

After the initial failure to transfer the most successful concept of drug-eluting stents to peripheral arteries [1], our 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 short-lasting drug delivery by either 100 ml 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 and the formulation with 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 agent had no recognisable effect compared to the plain balloon and plain contrast medium. Detailed analysis revealed efficacy in subgroups, such as diabetics, lesions with non-flow-limiting dissections, and patients suffering from restenosis after prior treatment. Long-term follow-up indicated benefits up to at least 5 years [4].

Meanwhile the treatment of femoropopliteal lesions with drug-coated balloons has been accepted as an improvement over POBA ('plain old balloon angioplasty'). Several different products have been developed and were introduced in various markets after they received CE mark and/or were approved by local health authorities, including FDA in the US or CFDA in China (Table 1). All coated PTA catheters contain Paclitaxel as an active ingredient. The dose depends on the size of the balloons, which is related to the reference diameter of the target vessel and the length of the lesion and is, therefore, given in µg/mm^2 balloon surface, which is closely related to the surface area of the treated vessel segment after dilatation. The dose range of various products varies between 2 and 3.5 µg/mm^2. Furthermore, products differ in respect to catheter/balloon properties, coating composition, dose and the method of coating.

Since the initial studies, drug carriers were admixed to the balloon-coating compositions to achieve sufficient adhesion of the drug during handling of the catheters, passage through the haemostatic valve and on the way to the treatment site, immediate and complete release during balloon inflation, and sufficient transfer of the drug to the vessel wall. Since drug carriers do not prevent restenosis on their own, amounts had to be limited to keep sufficient room on the surface of the small balloons for the active drug. The proportion of the drug to the drug carrier was 2:1 for the Paccocath™-formulation used in the Thunder trial and varies currently from 50 parts drug to 1 part carrier (Orchid) to 1:1 (Freeway).

Originally, an angiographic contrast agent was admixed to Paclitaxel because of its excellent solubility, the solubilising properties of paclitaxel, tolerance at extremely high doses in all vessel territories, and worldwide approvals by the health authorities. The only disadvantages are the more or less theoretically inherent risks in the vascular use of foreign compounds. Subsequent developments followed opposite directions:

a) Chemicals and pharmaceutical excipients with different useful properties related to adherence or solubility of paclitaxel but usually not approved for intra-arterial administration (e.g. shellac, Fig. 1b);
b) Well-tolerated endogenous substances serving the same purpose;
c) Substances with potentially beneficial pharmacological effects (e.g. resveratrol, Fig. 1c).

Furthermore, attempts were made to avoid inactive additives entirely, namely in DIOR I; the first DCB which received CE mark, Elutax™; and, more recently, Advance 18 Ptx. Literature and reports indicate no or low restenosis inhibition [5-7]. Table 1 provides a survey of products and carriers.

Comprehensive clinical trials have shown that at least some of the DCB mentioned in Table 1 inhibit restenosis following PTA without or with stent implantation, most likely also following arterectomy. The treatment with several of these DCBs significantly reduces the incidence of restenosis and related clinical events compared to POBA. For some products, it has been shown that the benefit lasts for two or more years. However, the available number of studies, the number of investigated patients and the quality of data varies widely between products. Surprisingly, up to now, neither the search for drugs other than Paclitaxel nor the use of a variety of very different additives has yielded DCB with distinctly superior efficacy than the initially tested and introduced paclitaxel-iopromide-coated balloons (Fig. 2). Compared to the early studies, more recent trials indicate efficacy in longer lesions. Further improvements are expected in respect to the yield of transfer to the vessel wall; however, measurements are limited to animal experiments and the scatter of results is high. The search for effective but better-tolerated drug candidates has not been successful thus far. Paclitaxel is unique in respect of the ratio between the systemically tolerated intravascular dose of ≥50 mg per patient and the effective dose on single balloons of usually between 1 and 10 mg.

Most progress was achieved in patient and lesion selection and vessel preparation for the use of DCB. Most likely because of the high efficacy of local drug delivery, no coating-related adverse events have yet been proven in clinical trials. Improvements may still be expected in various pathological conditions, vessel territories and patient populations, e.g. calcified vessels, restenosis after drug-eluting stent implantation and in the small but measurable proportion of cases in which the acute success of currently available interventions is not maintained over time.

Gunnar Tepe
(EBIR)
RoMed Klinikum Rosenheim/
University of Tübingen
Rosenheim/Tübingen,
Germany

Widely recognised as one of IR's leading experts on drug-eluting technologies, Prof. Tepe is a familiar face at CIRSE meetings. Head of the Institute for Diagnostic and Interventional Radiology at Klinikum Rosenheim and of Interventional Radiology and Angiography at the University of Tübingen, he trained in both paediatrics and internal medicine before completing his radiology training.
Since 1997, he has been Head of the Univerity of Tübingen's Laboratory for Experimental Interventional Radiology. His post-doctoral thesis examined radioactive stents for the prevention of restenosis after balloon angioplasty. He has won prizes from CIRSE, the German Röntgen Society and the Olbert Meeting, as well as the 2003 Wilhelm Conrad Röntgen Prize.
His co-authors, Dr. Daniel Peters-Berg and Prof. Ulrich Speck are based at Charité University Hospital in Berlin, Germany.

References:
1. Duda Sh, Bosiers M, Lammer J, Scheinert D, Zeller T, Tielbeek A, Anderson J, Wiesinger B, Tepe G, Lansky A, Mudde C, Tielemans H, Bérégi P. Sirolimus-eluting versus bare nitinol stent for obstructive superficial femoral artery disease: the SIROCCO II trial. J Vasc Interv Radiol 2005; 16:331-338
2. Scheller B, Speck U, Abramjuk C, Bernhardt U, Böhm M, Nickenig G. Paclitaxel balloon coating - a novel method for prevention and therapy of restenosis. Circulation 2004; 110: 810-814
3. Albrecht T, Speck U, Beier C, Wolf KJ, Böhm M, Scheller B. Reduction of in-stent restenosis after percutanous transluminal angioplasty of peripheral porcine arteries by local peri-interventional administration of Paclitaxel. Invest Radiol 2007; 42:579-585
4. Tepe G, Schnorr B, Albrecht T, Brechtel K, Claussen CD, Scheller B, Speck U, Zeller T. Angioplasty of femoral-popliteal arteries with drug-coated balloons 5-year follow-up of the THUNDER Trial. J Am Coll Cardiol Intv 2015; 8:102–108
5. Cortese B, Micheli A, Picchi A, Coppolaro A, Bandinelli L, Severi S, Limbruno U. Paclitaxel-coated balloon versus drug-eluting stent during PCI of small coronary vessels, a prospective randomised clinical trial. The PICCOLETO Study. Heart 2010; 96:1291-1296
6. Bondesson P, Lagerqvist B, James SK, Olivecrona GK, Venetsanos D, Harnek J. Comparison of two drug-eluting balloons: a report from the SCAAR registry. Eurointervention 2012; 8;444-449
7. Scheinert D. Advance™ 18 Ptx study. LINC 2013, Leipzig

Table 1: Survey of drug-coated PTA balloon catheters
Active ingredient: all paclitaxel; additives and published results on efficacy (preferentially in randomised clinical trials, subjective assessment).

Product (s)	Additive	Property of additive	Clinical outcome
(Paccocath) SeQuent Please, Cotavance	X-ray contrast agent	Approved for intra-arterial administration, very low toxicity, foreign substance, hypersensitivity reactions possible	Efficacious
In.Pact Admiral etc.	Urea	Small endogenous molecule, non-toxic, non-immunogenic	Efficacious
Dior II, Freeway	Shellac	No known effect	Moderately effective?
Legflow	Shelloic acid		
Lutonix/ Moxy	Surfactant	Dissolves paclitaxel, damage to cell membranes	Moderately effective
Pantera Lux Passeo Ranger, Danubio	Plasticiser	Chemical compounds for completely different purpose, surfactant	Efficacious Early promising data
Stellarex	PEG	Polymer, non-toxic	Efficacious
SeQuent Please OTW	Antioxidant	Potentially beneficial, protection of membranes, etc.	Efficacious
Orchid	Lubricant	Endogenous constituent, small proportion of coating	Efficacious
Chocolate Touch	Antioxidant	Potentially beneficial, protection of membranes, etc.	Efficacious
DIOR I, Elutax, Advance 18 Ptx	None	—	No or poor efficacy

Fig. 1: Selected drug carriers

1a) Iopromide: X-ray contrast material added in tiny amounts to Paclitaxel in the balloon-coating solution.

1b) Shellac: pharmaceutical excipient, e.g. coating of pills.

1c) Resveratrol: constituent of red wine; multiple beneficial cardiovascular effects, anti-inflammatory.

INTRODUCING THE ABRE™ VENOUS STENT

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.

RESTORING MOVEMENT RESTORING LIFE

BOOK YOUR PLACE AT THE LEARNING CENTER:
http://bit.ly/MedtronicCIRSE2017

medtronic.com/abre

IMPORTANT: Warnings, precautions, and instructions for use can be found in the product labeling.

Medtronic
Further, Together

IDEAS 2017

The impact of new technologies in TAAA

Andrea Stella and Enrico Gallitto

Don't miss it !
What's new – techniques
Lecture Session
Sunday, September 17, 10:00 – 11:00
Auditorium 3

Thoraco-abdominal aortic aneurysms (TAAAs) are considered challenging clinical scenarios. Despite modern intra/peri-operative adjuncts, TAAA open repair (OR) has substantial mortality and morbidity rates, even in high volume centres. Coselli et al. reported the largest experience of TAAAs treated by OR (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 therapeutic options to treat aortic aneurysms involving renal and splanchnic arteries. Several experiences reported the FB-EVAR feasibility and effectiveness for juxta/para-renal abdominal aortic aneurysms [2,3,4].

For the first time, in 2001 Chuter et al. reported total endovascular repair of TAAA by branched endograft [5]. In 2010, Bakoyiannis 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 7.1% and spinal cord ischaemia was 9.6% (paraparesis 7.1%, paraplegia 2.5%). Re-interventions occurred in 17% of cases [6].

In the last years, thanks to the technology evolution and increased knowledge, several papers were reported with encouraging 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 FB-EVAR 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 create 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 navigation (vessel navigator – a sort of 3D road map) and increases the accuracy of endograft implantation and the target visceral vessels cannulation [12]. Literature data demonstrated that hybrid room and vessels navigator significantly reduce the exposure to radiation (for both patients and physicians) and the total amount of iodinated contrast injection during FB-EVAR [12].

Spinal cord ischaemia remains a catastrophic complication after TAAA repair. After OR, the rate of SCI ranges between 4 and 11% [1,13,14], related with the extension of the aortic disease (TAAA type II > I > III e > IV) [1,13,14]. After endovascular repair of TAAA, the SCI ranges between 3 and 17% if we considered the first experiences. Recently, different endovascular/surgical strategies were proposed to reduce the rate of SCI. Kasprzak et al. reported a reduction of 5% of SCI by using the temporary sac perfusion [16]. Maurel et al. associated the concept of the temporary sac perfusion with the early lower limb/pelvic perfusion [8]. According to this protocol, the SCI rate was <3%. Both these approaches are based on the pre-conditioned theory of the spinal vascular blood supply [17,18]. We always used this approach when it was possible, maintain the patency of both hypogastric/subclavian arteries, and we reported an overall rate of spinal cord ischaemia of 6% (considering both elective and urgent cases). It is also important to underline that the role of the anaesthesiology team during the procedure and in the peri-operative period is crucial to reduce the risk of SCI (haemodynamic stability and spinal cord pressure).

Customisation of an appropriate commercially available FB-EVAR design requires usually 6-8 weeks and limits a wide application of this technology in urgent patients, such as cases with large asymptomatic and symptomatic/ruptured TAAAs. 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 [19,20]. 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 obtainable 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 136 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 fluoroscopy time [21]. There was a decrease in the proportion of patients suffering perioperative death or major complications from 23.5% in the first quartile to 8.8% in the fourth quartile. After adjustment for potential confounding factors, the odds of death or major complication were cut by 52.4% per quartile increase [21].

Andrea Stella
University of Bologna
Bologna, Italy

Prof. Andrea Stella graduated in Medicine and Surgery in 1972 at the University of Bologna, where he is now the Coordinator for the Master in Medicine and Surgery. He is also Director of Vascular Surgery at Sant'Orsola-Malpighi Hospital in Bologna. He is Editor-in-Chief of the Italian Journal of Vascular and Endovascular Surgery, and has co-authored over 400 scientific papers, abstracts and chapters. His research interests are mainly renovascular hypertension, vascular cerebrosis insufficiency, aortic aneurysms, arterial homologous transplantation and diabetes. Enrico Gallitto also works in surgery at the University of Bologna.

Peri-operative results

Author	Patients (n)	Technical Success (%)	30-day Mortality (%)	Spinal Cord Ischemia (%)
Greenberg[7]	406	-	5.7	4.3
Maurel[8]	204	92.6	6.9	3.9
Verhoeven[9]	166	95.0	8.0	9.0
Eagleton[10]	354	94.0	4.8	8.8
Oderich[11]	185	94.0	4.3	3.0

Table 1. Literature experiences (>150 cases) reported in the last years by high volume centres for FB-EVAR repair.

Follow-up results

Author	Months of Follow-up (mean ± SD)	Survival (% at 24-month)	TTV – patency (% at 24-month)	FFR (% at 24-month)
Greenberg[7]	–	–	–	–
Maurel[8]	–	–	–	–
Verhoeven[9]	29 ± 19	78	97	98
Eagleton[10]	23 ± 19	68	92* – 98 – 97	64
Oderich[11]	21 ± 20	68±5 / 72±6**	95	62

* 92–98–97: percentages referred to renal artery, superior mesenteric artery and celiac trunk, respectively.
** 68±5 /72±6: percentages referred to type I-III and type IV TAAAs, respectively

Table 2. Literature experiences (>150 cases) reported in the last years by high volume centres for FB-EVAR repair.

References:

1. Coselli JS, LeMaire SA, Preventza O, de la Cruz KI, Cooley DA, Price MD, Stolz AP, Green SY, Arredondo CN, Rosengart TK. Outcomes of 3309 thoracoabdominal aortic aneurysm repairs. J Thorac Cardiovasc Surg. 2016 May;151(5):1323-37
2. Kristmundsson T, Sonesson B, Dias N, Törnqvist P, Malina M, Resch T. Outcomes of fenestrated endovascular repair of juxtarenal aortic aneurysm. J Vasc Surg. 2014 Jan;59(1):115-20
3. Gallitto E, Gargiulo M, Freyrie A, Mascoli C, Massoni Bianchini C, Ancetti S, Faggioli G, Stella A. The endovascular treatment of juxta-renal abdominal aortic aneurysm using fenestrated endograft: early and mid-term results. J Cardiovasc Surg (Torino). 2015 Sep 29
4. Oderich GS, Ribeiro M, Hofer J, Wigham J, Cha S, Chini J, Macedo TA, Gloviczki P. Prospective, nonrandomized study to evaluate endovascular repair of pararenal and thoracoabdominal aortic aneurysms using fenestrated-branched endografts based on supraceliac sealing zones. J Vasc Surg. 2017 May;65(5):1249-1259.e10
5. Chuter TA1, Gordon RL, Reilly LM, Pak LK, Messina LM. Multi-branched stent-graft for type III thoracoabdominal aortic aneurysm. J Vasc Interv Radiol. 2001 Mar;12(3):391-2.
6. Bakoyiannis CN, Economopoulos KP, Georgopoulos S, Klonaris C, Shialarou M, Kafeza M, Papalambros E. Fenestrated and branched endografts for the treatment of thoracoabdominal aortic aneurysms: a systematic review. J Endovasc Ther. 2010 Apr;17(2):201-9
7. Greenberg R1, Eagleton M, Mastracci T. Branched endografts for thoracoabdominal aneurysms. J Thorac Cardiovasc Surg. 2010 Dec;140(6 Suppl):S171-8
8. Maurel B, Delclaux N, Sobocinski J, Hertault A, Martin-Gonzalez T, Moussa M et al. The impact of early pelvic and lower limb reperfusion and attentive peri-operative management on the incidence of spinal cord ischemia during thoracoabdominal aortic aneurysm endovascular repair. Eur J Vasc Endovasc Surg. 2015;49(3):248-54
9. Verhoeven EL, Katsargyris A, Bekkema F, Oikonomou K, Zeebregts CJ, Ritter W et al. Ten-year Experience with Endovascular Repair of Thoracoabdominal Aortic Aneurysms: Results from 166 Consecutive Patients. Eur J Vasc Endovasc Surg. 2015 May;49(5):524-31
10. Eagleton MJ, Follansbee M, Wolski K, Mastracci T, Kuramochi Y Fenestrated and branched endovascular aneurysm repair outcomes for type II and III thoracoabdominal aortic aneurysms. J Vasc Surg. 2016 Apr;63(4):930-42
11. Oderich GS, Ribeiro M, Reis de Souza L, Hofer J, Wigham J, Cha S. Endovascular repair of thoracoabdominal aortic aneurysms using fenestrated and branched endografts. J Thorac Cardiovasc Surg. 2017 Feb;153(2):S32-S41.e7
12. A. Hertault, B. Maurel, J. Sobocinski, T. Martin Gonzalez, M. Le Roux, R. Azzaoui, M. Midulla, S. Haulon. Impact of Hybrid Rooms with Image Fusion on Radiation Exposure during Endovascular Aortic Repair. European Journal of Vascular and Endovascular Surgery. Volume 48 Issue 4 p. 382e390 October/2014
13. Svesson LG, Crawford ES. Experience with 1509 patients undergoing thoracoabdominal aortic operations. J Vasc Surg 1993; 17:357-370
14. Coselli JS, LeMaire SA, Miller CC, Schmittling ZC, Koksoy C, Pagan J et al. Mortality and Paraplegia after thoracoabdominal aortic aneurysm repair: a risk factor analysis. Ann Thorac Surg 2000; 69: 409-14
15. Verzini F, Loschi D, De Rango P, Ferrer C, Simonte G, Coscarella C et al. Current results of total endovascular repair of thoracoabdominal aortic aneurysms. J Cardiovasc Surg (Torino). 2014 Feb;55(1):9-19
16. Kasprzak PM, Gallis K, Cucuruz B, Pfister K, Janotta M, Kopp R. Temporary aneurysm sac perfusion as an adjunct for prevention of spinal cord ischemia after branched endovascular repair of thoracoabdominal aneurysms. Eur J Vasc Endovasc Surg. 2014; 48(3):258-65
17. Etz CD, Kari FA, Mueller CS, Brenner RM, Lin HM, Griepp RB. The collateral network concept: remodelling of the arterial collateral network after experimental segmental artery sacrifice. J Thor Cardiovasc Surg 2011; 141:1029-1036
18. Etz CD, Kari FA, Mueller CS, Silovitz D, Brenner RM, Lin HM et al. The collateral network concept: a reassessment of the anatomy of spinal cord perfusion. J Thor Cardiovasc Surg 2011; 141:1020-1028
19. Bosiers MJ, Bisdas T, Donas KP, Torsello G, Austermann M. Early experience with the first commercially available off-the-shelf multibranched endograft (t-Branch) in the treatment of thoracoabdominal aortic aneurysms. J Endovasc Ther. 2013;20:719–725
20. Gallitto E, Gargiulo M, Freyrie A, Pini R, Mascoli C, Ancetti S, Faggioli G, Stella A. Off-the-shelf multibranched endograft for urgent endovascular repair of thoracoabdominal aortic aneurysms. J Vasc Surg. 2017 Mar 30. pii: S0741-5214(17)30202-1
21. Benjamin W. Starnes, MD, Michael T. Caps, MD, Zachary M. Arthurs, MD, Billi Tatum, RN,and Niten Singh, MD, Seattle, Wash; Honolulu, Hawaii; and San Antonio, Tex Evaluation of the learning curve for fenestrated endovascular aneurysm repair. J Vasc Surg 2016;64:1219-27

Don’t miss the new IR practice workshop tomorrow!

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

be inspIRed...

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 baths (okay – it may be a little 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 went on to introduce insulin treatment in 1922; Johannes Fibiger 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.

QUESTIONS OF THE DAY

Sunday, September 17, 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 recommended for student sessions.

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

1. The best indication for thermal ablation of a renal tumour is one of the following:
   a. T1a tumours
   b. T2a tumours
2. At the end of 2016 CIRSE became a member of which organisation that promotes interdisciplinary cancer care?
3. Name three recent studies in IR from Denmark (full titles required).

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

ARE YOU READY?

CIRSE **Radiation Protection**

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

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

IR Congress News is published as an additional source of information for all CIRSE 2017 participants. The articles and advertorials in this newspaper reflect the authors' opinions. CIRSE does not accept any responsibility regarding their content.
If you have any questions about this publication, please contact us at publications@cirse.org.

Editors-in-Chief: *Christoph Binkert and Fabrizio Fanelli*
Managing Editor: *Helen Hemblade*
CIRSE Office Editorial Team: *Ciara Madden, Petra Mann and Michelle Weiss*
Graphics/Artwork: *LOOP. ENTERPRISES media / www.loop-enterprises.com*

Cardiovascular and Interventional Radiological Society of Europe CIRSE

WHY COMPROMISE?

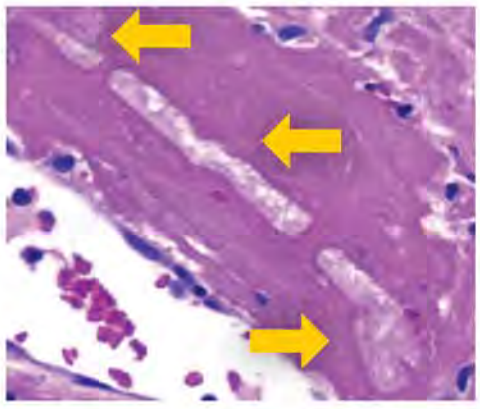
PRE-CLINICAL HEAD-TO-HEAD COMPARISON OF DOWNSTREAM CRYSTALLINE MATERIAL.

LUTONIX® 035
Drug Coated Balloon PTA Catheter

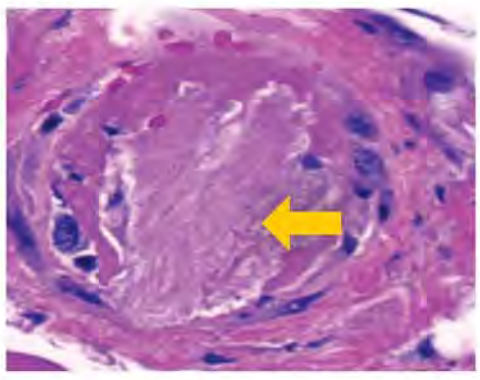
DCB BRAND 1

ZERO

Crystalline Material
Observed with
1x and 3x Balloons



1x Balloon
Observed at
28 Days



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. Journal of Vascular and Interventional Radiology.

Frank D. Kolodgie, PhD, Erica Pacheco, MS, Kazuyuki Yahagi, MD, Hiroyoshi Mori, MD, Elena Ladich, MD and Renu Virmani, MD

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

Advancing Lives and the Delivery of Health Care™

BARD

Preclinical results may not be indicative of clinical performance. Different test methods may yield different results.

Journal of Vascular and Interventional Radiology: Comparison of Particulate Embolization after Femoral Artery Treatment with In.Pact Admiral versus LUTONIX® 035 Paclitaxel-Coated Balloons in Healthy Swine. Limitations associated with this pre-clinical study include: Pathologic findings are limited to healthy swine and do not account for the fact that human PAD presents with co-morbidities; and transferring pre-clinical findings in healthy animal arteries to humans with peripheral arterial disease is complex, as lesions can be complicated by fibrosis, necrosis and calcification. This study was funded by LUTONIX, Inc. (New Hope, Minnesota). Article available at: http://dx.doi.org/10.1016/j.jvir.2016.06.036. Kolodgie et al, JVIR D-15-01131R1.

The LUTONIX® 035 Drug Coated Balloon Catheter is intended for Percutaneous Transluminal Angioplasty (PTA) in the peripheral vasculature and for the treatment of obstructive lesions and decreasing the incidence of restenosis. In addition, the LUTONIX® 035 Drug Coated Balloon Catheter is intended for PTA of native dialysis fistulae or synthetic grafts, opening narrowing and immature fistulae, to improve blood flow, and decreasing the incidence of restenosis.

The LUTONIX® DCB Catheter is contraindicated for use in patients with a hypersensitivity to paclitaxel or paclitaxel related compounds, in women who are breastfeeding, pregnant or are intending to become pregnant and in men intending to father children. **Please consult Bard product labels and inserts for any indications, additional contraindications, hazards, warnings and instructions for use.**

Lutonix, Inc., a subsidiary of C. R. Bard, Inc., 9409 Science Center Drive | New Hope, MN 55428 USA | Tel: +1 763 445 2352 | Fax: +1 763 445 2353
Bard Ltd., Forest House, Brighton Road, Crawley | West Sussex, RH11 9BP, United Kingdom | Tel: +44 1293 527888 | Fax: +44 1293 552428 | www.lutonix.com LU/9004/0317/0090

CE 0086