1/2022

IR news

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IASIOS – a great first year

MEETING

A return to in-person congresses!

EDUCATION

ESIR travels to Strasbourg

WELCOME TO ECIO 2022

Cardiovascular and Interventional Radiological Society of Europe

Content

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CIRSE has started 2022 strong, with a return to in-person meetings and more educational opportunities than ever!

Dear colleagues,

We're already several months into 2022, and while challenges persist due to the ongoing pandemic, there certainly seems to be a light at the end of the tunnel.

We have not slowed our pace, and as we continue to offer online educational opportunities enabling remote IR collaboration and exchange, we are thrilled to be able to return to in-person meetings.

ESIR is back!

The European School of Interventional Radiology is back and has already hosted two successful in-person courses this year. A venous focused course took place last March in Harlow, U.K., and I had the pleasure of hosting the February course on ablation at the Institute of Image-Guided Surgery in Strasbourg, France. Turn to page 60 for more on these courses, as well as on the upcoming TACE course that will take place in Munich this May!

ECIO 2022

The European Conference on Interventional Oncology will take place in Vienna just a few short days from now. We are eager to see our friends and colleagues in person and are anticipating an excellent congress. Some of the faculty members have generously given us a sneak peek of what we can expect from their upcoming lectures – flip to page 11 for a first look at what awaits us during the congress.

While we wish everyone could join us in Vienna, it's not feasible for all of us. With this in mind, all ECIO 2022 lectures will also be available via our online platform, both live and on-demand, ensuring your access to IO education no matter where you are.

ET 2022

The European Conference on Embolotherapy will also make a return to an in-person event this June in Nice, France, and several faculty members have already given us previews of their lectures. You can find these on page 41.

As with ECIO, ET will also feature an online platform allowing anyone who can't make it to France to join in remotely.

IASIOS – a great first year

The International Accreditation System for Interventional Oncology Services has seen success beyond its initial expectations since its public launch last year. Established to encourage the adoption of quality standards for interventional oncology on a global scale, this initiative raises the bar for standards of care in IO while building a dedicated network of IO experts worldwide. Hear directly from faculty at some of the participating facilities on page 8.

EBIR – record numbers

The EBIR exam has increased accessibility in many ways over the last two years! Not only is the exam now available remotely, it is now possible to sit the exam in English and German, and a new Spanish version will be offered for the first time this October. Turn to page 62 for all the details!

War in Ukraine

CIRSE has a mission to unite all European nations and support harmonious international collaboration. We are deeply saddened by the war in Ukraine and stand with our affected members, colleagues, and their loved ones. As a token of solidarity, CIRSE has given free membership to Ukrainian IRs through the Association of Interventional Oncologists of Ukraine, and we have donated to Doctors Without Borders.

Science for people

The following pages include a small look at CIRSE 2022. Preparations are well underway for our annual congress, and the scientific programme is already online for your perusal!

I look forward to seeing you all in person very soon. In the meantime, I hope you enjoy this edition of IR News!

Afshin Gangi
CIRSE President

Over the years, CVIR has established a reviewer database of experts qualified to review manuscripts based on their educational background and experience.

CVIR Reviewers

CVIR strives to invite the most qualified, suitable reviewers for all submissions that undergo a peer-review process in order to ensure a high standard of objective, unbiased and timely reviews. In 2021 alone, 500+ reviewers from 52 different countries supported our editors by carefully assessing manuscripts and writing more than 1,100 reviews for CVIR.

Save the date for the CVIR Reviewer Workshop!

CVIR is hosting a practical, hands-on online reviewer workshop at the beginning of May! The workshop will simulate the process of reviewing for CVIR and will involve submitting a real review for one of two dummy papers ahead of the workshop so you can discuss your review comments at the workshop itself. CVIR Associate Editors Tiago Bilhim, Julien Garnon, Miltiadis Krokidis, and Bien Soo Tan will be joined by Editor-in-Chief Klaus Hausegger to go through the papers and give their thoughts from their perspective as editors.
We hope to see you there!

DATE: MAY 4, 2022

Time: 14:00 CEST

Place: Online via Zoom

Registration: Please click here

Claim your CME credits as a CVIR reviewer

To get recognition for your valuable contributions, you can request a Reviewer Recognition Certificate stating the number of reviews you carried out in 2021. The certificate can be used to claim up to three CME credits from the UEMS or your corresponding national accreditation body for every review carried out. Request your certificate from the CVIR Editorial Office at info@cvironline.org or at www.cvironline.org/contact.

Become a reviewer!

Some of the great benefits of being a reviewer are that you can:

1. have a chance to be recognised within the field and expand your knowledge.
2. include your reviewer experience in your CV/resume.
3. grow professionally by updating your knowledge and expertise within the field.
4. further develop critical thinking and an eye for detail, which are essential for research and professional development.
5. read the latest research before everyone else and be able to constructively improve the published works in IR with your assessment.
6. help ensure the quality and integrity of research published in IR.
7. improve your writing skills.

If you would like to join CVIR's reviewer team, send your CV to the CVIR Editorial Office at info@cvironline.org, indicating your area of expertise and interest.
Please note that in order to apply, you need to have completed your interventional radiology training.

PEER-REVIEW IN 2021

Review invitations sent: 2,649

Completed review reports: 1,117

Average time needed to complete a report: 9.3 days

Number of Reviews per Reviewer: 2.3

Top three reviewer countries of origin:
United States, Italy, Germany

Contact the CVIR Editorial Office at: info@cvironline.org for any questions you might have.

Follow CVIR for latest updates!

A new video series lets authors speak more about the thoughts and motivations behind their research.

Get to know CVIR Endovascular Authors

At CVIR Endovascular, we have come up with a new initiative to put our authors in the spotlight to discuss important issues in IR, give us insights into what drives their research and share their tips and techniques with other IRs. The series premiered in February and new videos are added twice per month.

All these videos are announced on our social media channels (Facebook, Twitter and LinkedIn) and available to watch on the CVIR Endovascular YouTube playlist as well as on our Author Spotlight page!

We heard from Dr. Gregory Makris about how women are still getting unnecessary hysterectomies when there is an endovascular alternative to surgery that would allow them to keep their uterus.

Dr. Warren Clements highlighted splenic arterial embolisation as an alternative to splenectomies after blunt trauma and explains how this procedure can be integral in preserving the spleen.

Dr. Monica Matsumoto presented a novel approach to a common procedure and how sharp venous recanalisation via hybrid CT-angiography offers a way out after multiple failed attempts with traditional recanalisation techniques.

Dr. Osman Ahmed discussed the collaborative approach taken for treating a patient with chronic portal venous occlusions before a liver transplant, and how they combined two techniques to help the patient face better outcomes after transplantation.

You can also look forward to authors from some of our best-performing articles discussing their papers in future videos.

Key themes from this series so far include:

- The need for more collaboration with IRs and medical specialists from other specialties
- Innovative techniques, such as the pigtail through the snare
- New twists on old techniques, or combining different techniques in complicated clinical scenarios
- As always, what this all means for patients! Lower radiation dose, less recovery time, keeping vital organs intact, and more.

Click here to learn more!

Next Research is a contract research organisation (CRO) established and owned by the CIRSE Foundation, dedicated to promoting evidence-based medicine in interventional radiology.

Taking research in IR to the next level

With nine dedicated staff members, we at Next research aim to provide research services tailored to image-guided, minimally invasive medicine as well as educational activities geared towards the IR community.

By establishing a link between practitioners and industry, we hope to ensure that data needs can be identified and addressed by conducting data collections that yield real value to practitioners, industry, and patients.

Our current data collections are:

- quantitative
  - prospective observational cohort studies (e.g., post-market clinical follow-up, reimbursement)
  - systematic literature reviews
- qualitative
  - surveys
  - consensus meetings
  - structured interviews

Furthermore, by providing webinars and training courses, we hope to address the knowledge and skill gap many young IRs are facing with regard to clinical research in order to equip young talents in IR with the skills, knowledge and tools necessary to become leaders of tomorrow.

With experienced staff as well as a network of hundreds of expert medical professionals and sites across Europe, all our projects benefit from expert input from step one. This integration of clinical expertise with a high-quality research service will make a difference in your data collection or educational project.

Whatever your needs are, Next Research will help you take the next step.

If you would like to receive further information on Next Research and our services, please contact:

Nathalie Kaufmann
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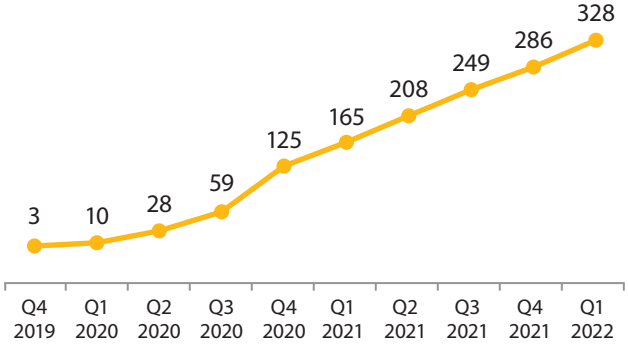
The CIRSE Emprint Microwave Ablation Registry is currently enrolling.

CIEMAR reaches more than 320 patients

CIEMAR is a prospective, single-arm, multi-centre observational study that aims to observe the real-life use of MWA treatment for colorectal liver metastases in Europe. CIEMAR is currently enrolling patients from 35 sites and recently enrolled its 328th patient.

CIEMAR – pushing for 500 patients

To ensure that the CIEMAR cohort is large enough to draw meaningful conclusions from, high patient enrolment is essential. Despite the pandemic and related challenges to patient care and research projects, participating sites are doing their best to enrol patients as shown in the graph.



After patient enrolment is completed in January 2023, another three years will be used for the collection of long-term follow-up data to fulfil the secondary endpoint of the study on overall survival.

- **September 2019** | Beginning of enrolment
- **October 2021** | PMFC approval
- **March 2022** | 320th patient enrolled
- **January 2023** | End of patient recruitment
- **January 2026** | End of follow-up

Enrolling centres

The participating sites are located in 11 different countries. The country with the highest number of patients is the Netherlands, with 77 patients. Italy follows with 72 patients, Germany with 66 and North Macedonia with 26.

Impact of CIEMAR on the use of MWA to CRLM patients
CIRSE 2021

"With CIEMAR we show to oncologists that we are willing to get clinical evidence and that we believe in the effectiveness of our interventional therapies, as CIEMAR will collect real-life data in a very heterogeneous clinical setting and compare these data with published results."

Prof. Phillipe L. Pereira
Chairperson
SLK Kliniken Heilbronn, Germany

CIEMAR

If you are interested in participating in CIEMAR or would like to receive further information on the research project, please contact:

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Data collection for two of our observational studies is coming to an end.

Studies in the closeout phase

The CIRSE registry for SIR-Spheres in France (CIRT-FR) and the CIRSE registry on Life-Pearl Microspheres (CIREL) are getting ready to wrap up and publish their final results in 2022 and 2023.

CIREL

The pan-European CIRSE registry on LifePearl Microspheres in patients with colorectal cancer with liver metastases (CIREL), will close data inclusion by the end of April 2022 after more than four years of active patient and follow-up data collection.

Enrolling centres

With a total of 152 patients, CIREL has already disseminated patient characteristics, treatment and safety data in 2020 and 2021. CIREL data was presented at MIO Live 2021, ECIO 2021 and CIRSE 2021.

CIREL timeline

- **ECIO 2022** | Real-life and long-term effectiveness results
- **30. April 2022** | Database closeout
- **ET 2022** | Safety results
- **CIRSE 2022** | Early and long-term effectiveness results

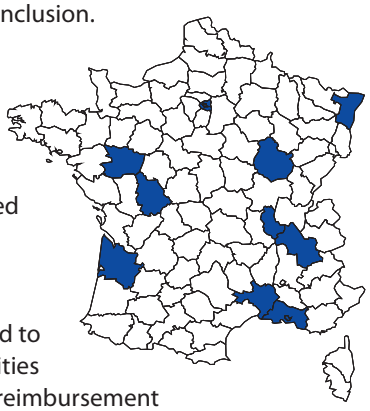
Disemination plans will continue for CIREL in 2022, starting up with safety and feasibility results that will be presented at ECIO and ET. Data on real-life and long-term effectiveness has been submitted for presentations at ESMO-GI and CIRSE 2022, respectively.

Do not miss the chance to deepen your knowledge on TACE in mCRC from one of the largest data collections in Europe by attending an upcoming presentation!

CIRT-FR

The CIRSE registry for patients with primary and secondary liver tumours treated with SIR-Spheres in France (CIRT-FR) started data collection in August 2017, and after five years and 332 patients enrolled it is only four months away from the end of follow-up data inclusion.

Enrolling centres



CIRT-FR published its interim results on real-life data on 200 patients treated with SIR-Spheres in France in September 2020.
In August 2021, the clinical study report was submitted to the national health authorities to support the renewal of reimbursement for SIR-Spheres in France for five more years.

CIRT-FR timeline

- **April 2022, Now** | Follow-up data collection
- **June 2022** | Decision on reimbursement by HAS
- **August 2022** | Database closeout
- **December 2022 and 2023** | Final results

Many exciting milestones will be reached in 2022 and 2023. The evaluation on the renewal of reimbursement for SIR-Spheres in France was slightly delayed, and the decision by the national health authorities is expected in summer 2022.

Final data will be published in 2023.

If you would like to receive further information on CIREL and CIRT-FR please contact:

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Introducing a new Europe-wide prospective multi-centre observational study to evaluate the effectiveness of percutaneous electrochemotherapy for liver cancer.

The RESPECT study

RESP**ECT**

Electrochemotherapy, from skin to liver

Electrochemotherapy (ECT) is a non-thermal local tumour ablation technique (LAT) that combines chemotherapy with reversible electroporation to transiently permeabilize the cell membrane and thereby increase the cytotoxicity of the chemotherapeutic agent. Initially designed for superficial tumours, ECT is recognized by National and European guidelines as a safe and effective option for the management of primary skin cancer and cutaneous metastases.

Motivated by the successful use of ECT for superficial malignancies, the community expanded the range of its application to deeper, anatomically challenging tumours, including bone metastases, soft tissue tumours, pancreatic and liver cancer. In the context of liver malignancies, ECT overcomes limitations encountered by more established LATs as it can be used in the vicinity of critical structures, and is not affected by the heat-sink effect of large blood vessels which reduce the efficacy of thermal ablation.

After the feasibility, safety and effectiveness of intraoperative ECT was proven in large cohorts of patients with liver cancer, recent smaller studies have introduced percutaneous ECT (pECT) as a minimally invasive treatment option. When compared to other percutaneous LATs, pECT showed good results in local tumour control of primary and secondary liver tumours, further promoting the technique as a promising new tool for the management of liver malignancies.

RESPECT explained

Sponsored by CIRSE and managed by its CRO, Next Research, The RegiSTry on Percutaneous ElectroChemoTherapy (RESPECT) is a prospective, Europe-wide, multi-centre, single-arm observational study that will collect data on pECT using the CLINIPORATOR® in patients with any type of primary or secondary liver malignancy.

Co-chaired by Prof. Philipp Wiggermann, Head of Radiology and Nuclear Medicine at the Städtisches Klinikum Braunschweig, Braunschweig, Germany, and PD. Dr Attila Kovács, Head of the Clinic for Interventional and Diagnostic Radiology and Neuroradiology at the MediClin Robert Janker Klinik, Bonn, Germany, the multidisciplinary RESPECT Steering Committee consists of a panel of interventional radiologists and oncologists from different centres in Europe and the USA who provide crucial scientific support to the study.

A. Kovács on the importance of RESPECT:
"While I am convinced of the performance of percutaneous ECT, RESPECT is important as it will embed the therapy in evidence-based knowledge, in the overall context of all other interventional oncology procedures."

RESPECT aims to enrol 250 patients over a period of 2 years, starting in September 2022. With a maximum follow-up period of 3 years, the registry is projected to end in September 2027.

RESPECT Objectives

The primary objective of RESPECT is to assess the real-life therapeutic efficacy of pECT for the treatment of liver malignancies in a large and diverse patient population. The secondary objectives of the registry are to evaluate the safety of the treatment as well as its impact on patient's quality of life.

Overall, RESPECT intends to provide healthcare professionals and health authorities with information on pECT for the management of liver malignancies to help decision-making regarding treatment access and modalities and optimize patient care.

More information on RESPECT is available at www.nextresearch.org/respect or www.clinicaltrials.gov (ID: NCT05267080).

If you are interested in participating in RESPECT or would like to receive further information on the project, please contact:

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The International Accreditation System for Interventional Oncology Services had a great first year!

IASIOS – A booming success in its first year

IASIOS was established to encourage the adoption of quality standards for interventional oncology on a global scale, accelerate the development of the field and increase the awareness of IO treatments and the facilities that offer them. This is achieved alongside a steadily growing community of dedicated IO experts worldwide.

It is essential for patient safety and satisfaction that IOs have the ability and means to officially prove their value and expertise, not as technicians, but rather as primary clinical providers to patients and hospital administrators. Acquiring the IASIOS seals enables hospitals to certify their commitment to optimising patient care with quantifiable benchmarks, and offers the opportunity to demonstrate their fulfilment of the CIRSE Standards of Quality Assurance in IO.

IASIOS is more than an accreditation system, it is also a membership programme. While the main goal is raising the bar for the standards of care in IO, building a worldwide network and community of like-minded IOs supporting, mentoring and learning from each other is key to the growth of the discipline and will accelerate the adoption of the relevant techniques in IR departments around the world, which, in turn, would allow many more cancer patients to be treated.

Major milestones

Since launching publicly less than one year ago, IASIOS has had success far beyond its initial expectations with the number of early adopters of the accreditation programme. The number of IASIOS facilities increased from 12 to 22 centres, with several more incoming centres having initiated the process with their hospital administration.

Moreover, the number of centres that have been able to achieve the status of IASIOS Accredited Centre went from four to ten, the first hospitals from their respective countries to become IASIOS Accredited (Germany, Switzerland, Italy, Singapore, Australia and the Netherlands).

Furthermore, two major global milestones were achieved when the first IASIOS Accredited Centre in the Southern Hemisphere was awarded to I-Med Radiology, Wesley Hospital in Australia and the first IASIOS Accredited Centre in Asia was awarded to Singapore General Hospital.

Community growth and support

The IASIOS community is comprised not just of the IOs themselves, but of the entire team that works along the patient pathway from participating IASIOS Enrolled Centres and Accredited Centres, the IASIOS Council and Committee, with over 25 distinguished volunteer members from the world's top IO hospitals including Asia, Australia, Europe, North America and South America. IASIOS has also received the support of over 20 national societies worldwide.

To build and strengthen the community, an annual benefits programme for the IO team will be rolled out in stages starting in 2022, including opportunities for career and professional development, networking and mentorship, learning and training workshops, promotion and recognition of the hospital, department and IO team and finally survey and benchmarking opportunities.

Testimonials from IOs around the world

"IASIOS accreditation provides us with the confidence that we are providing the highest standard of care, and will allow us to adopt new and evolving technologies within a quality framework. Furthermore, it will provide confidence to patients and referrers that our centre can be trusted to deliver the best possible care."

Dr. Nick Brown, I-Med Wesley, Australia

IASIOS aims to build a worldwide network of like-minded IOs who support, mentor and learn from each other.

"We at Azienda Ospedaliero Universitaria Pisana, University of Pisa, are extremely honoured and proud to be the first centre in Italy accredited for the Interventional Oncology service. We strongly believe in quality in patient care and pursuing the accreditation was of help in identifying where we had to improve and what we had already succeeded in. We found an incredible support in the hospital administration and in all the departments we work with for the treatment of oncology patients. Collaboration is really the basis for reaching this important goal. We are now aware our IO service is of high quality and meets rigorous international standards, and we are trying to understand where and how we can further improve. Quality for patient care is never enough."

Prof. Laura Crocetti, Pisa University Hospital

"The Interventional Radiology Center at Singapore General Hospital (SGH) is deeply honoured to receive IASIOS accreditation, which distinguishes our Interventional Oncology (IO) Services to be among the best in the world. This is a significant milestone for SGH and has further enhanced SGH's strong reputation of providing high-quality clinical care. IASIOS accreditation is a strong endorsement and recognition that our IO services is of high quality and meet rigorous international standards. This will be very reassuring to both our patients and referring clinicians. Going through the IASIOS certification process has been an humbling experience and has inspired us to further strengthened our processes to provide safe and efficacious care that is of high value and quality, not just for IO but also all other IR services."

Prof. Kiang Hiong Tay, Singapore General Hospital

"It is with great honour that we have received the IASIOS accreditation. The IASIOS team has been tremendously helpful in guiding us through the process. It has been a great learning process as the accreditation process gave us insight in those things that are well organized in our centre as well as the areas that need improvement. The IASIOS helps centres to go from good to excellent!"

Dr. Mark Burgmans, Leiden University Medical Centre

Enrol your facility

To enrol your centre in the IASIOS system and become part of a greater worldwide community of top IO centres, visit www.iasios.org or contact the IASIOS team directly at office@iasios.org.

You will be able to utilise the support provided by the IASIOS office and optional consultancy while you are in the process of improving your IO service lines and preparing your IASIOS application.

ONLINE EDUCATION AT THE HIGHEST LEVEL

FROM CURRICULUM TO CAREER

CIRSE academy

Interventional Oncology

Arterial Intervention

Aortic Intervention

Non-Vascular Intervention

Embolisation

Venous Intervention

Neurointervention

IR Management

The CIRSE Academy offers a comprehensive range of **online courses curated by leading IR experts** in the field. Over **40 courses across 8 topics** provide the ideal opportunity to attain essential IR knowledge and prepare for the EBIR exam.

For advanced learners, the CIRSE Academy additionally provides four specialist courses:

S CME accredited

TEVAR

Aortic Intervention

S

Endovascular therapy below the knee and pedal

Arterial Intervention

S CME accredited

EVAR

Aortic Intervention

S

Clinical practice in endovascular intervention

IR Management

CIRSE members and EBIR candidates are eligible for a reduced fee. After purchasing the Digital All-Access Pass, all courses can be accessed via:

cirse.org/academy

Cardiovascular and Interventional Radiological Society of Europe

ECIO 2022 will take place both in person and online.

Welcome to ECIO 2022!

The European Conference on Interventional Oncology has been providing a platform for collaboration and knowledge exchange in interventional oncology since 2008.

ECIO moved online during 2020 and 2021 in response to the pandemic. Now, at last, it's possible to meet together in person, and the congress will return for a second time to Vienna, Austria between April 24 and 27.

The scientific programme committee, headed by Philippe Pereira and Laura Crocetti, is thrilled to welcome delegates to a meeting covering the entire spectrum of treatments that interventional oncology can offer to patients from well-established therapies to the newest, most cutting-edge technologies.

The programme features a variety of session types tailored to delivering the ideal learning experience, including clinical focus sessions providing updates on the latest evidence, technical focus sessions, hands-on learning opportunities and more!

Click here to browse the full programme!

We hope to see you in Vienna! But if not…

Although the ability to return to an in-person meeting marks a huge step towards a return to normality, not everyone will be able to travel easily this spring.

To ensure that IOs across the globe can still access this important educational opportunity, ECIO 2022 will also feature an online platform that can be viewed from anywhere in the world. Excluding the hands-on workshops, all sessions taking place in Vienna will be broadcast live and then available to watch on demand shortly after their conclusion.

Holders of the 2022 Digital All-Access Pass have automatic access to the ECIO 2022 online platform, which will be reachable via the ECIO and CIRSE websites shortly before the start of the congress.

Take a sneak peek!

Several ECIO 2022 faculty members have generously given us an insight into their upcoming lectures at the congress. Read on for a small preview of all that awaits at ECIO 2022!

ECIO 2022 – DR. TOSHIHIRO IGUCHI

Catch this lecture during the Basic Course: Lung 2 on Monday, April 25, 17:00-19:00 CEST in Auditorium 3!

Thermal ablation in lung metastases: indications and results

The lung is known to be one of the most common metastatic organs, and lung metastasis are sometimes a life limiting factor. Although metastasectomy is a curative therapy for patients with limited lung metastases, this surgery is not suitable for all patients. For such patients, thermal ablation or radiation therapy (e.g., stereotactic body radiation therapy) [1, 2] may be alternative therapy options. The advantages of thermal ablation include a lesser effect on pulmonary function, the possibility of re-treatment for tumours with local progression, and the possibility of performing treatment under local anaesthesia.

Which ablation is used?

Thermal ablation includes mainly the following three therapies: radiofrequency ablation (RFA), microwave ablation, and cryoablation. No study has prospectively compared their results for lung metastases. Each treatment has different characteristics (both advantages and disadvantages), and RFA is currently the most evaluated technique [1, 3].

Indications

First, general contraindications to percutaneous puncture and therapy, including leukopenia, thrombopenia, coagulation disturbances or substantial organ dysfunction are not indicated [1, 4]. Although an impaired pulmonary function is not an absolute contraindication, severe lung emphysema with bullae is a contraindication, due to the risk of intractable fistula and respiratory failure [3]. At our institution, a patient with a single lung is also a contraindication, as though some authors reported sufficient results in such cases, we experienced one death 53 days after RFA for a patient with severe emphysema and post-pneumonectomy [5, 6]. Although there is a lack of strict criteria in selecting for thermal ablation for lung metastases, the following cases are ideal: i) the patient is a fit candidate for ablation, ii) the primary cancer is controlled or controllable, iii) there are no or controllable extra-pulmonary metastases, iv) thermal ablation (or combination with other treatments) can completely treat the lung metastases, and v) the number of lung metastasis is ≤5 (i.e., oligometastases). Especially for oligometastases in colon cancer, renal cell carcinoma, and sarcoma, thermal ablation can be considered [1, 2, 7-9]. Additionally, the following patients may sometimes be indicated even if curative therapy is not possible; First, when lung metastases grow slowly and systemic therapy is not established and may be ineffective, thermal ablation may be performed for large metastases [10]. Second, patients with functional lung metastases may be indicated, as symptoms may improve even without treating all of them [11]. Operators must know that the assessment before ablation is very important. In 20 % patients with lung metastases from colorectal cancer, PET/CT changed the treatment strategy because the presence of extra-pulmonary lesions was proved [12].

Results

Many investigators reported sufficient results from thermal ablation for lung metastases from various types of primary malignancy (e.g., colorectal cancer, lung cancer, oesophageal cancer, hepatocellular carcinoma, renal cell carcinoma, sarcoma, breast cancer, head and neck cancer, and melanoma). There are no differences in local efficacy for each primary lesion [13, 14]. Thermal ablation offers a local control rate ranging between 80 and 90 % for tumours <3 cm in diameter [3]. The largest study reported an overall survival (OS) after RFA similar to that of surgery in 566 patients with 1037 treated lung metastases [15]. Similarly, in patients with oligometastatic lung disease, OS did not differ significantly between RFA and surgery [13]. Colorectal cancer lung metastasis is one common indication for thermal ablation, and the latest review reported the various survival outcomes (median OS, 33-68 months; 5-y OS, 20-61%; median disease-free survival, around 8 months; and disease-free survival, 63.9% at 6-mo, 33.1% at 1-y, and 11.2% at 5-y) [16]. One retrospective study reported that after ablation, 30% of patients with lung oligometastases were free from cancer recurrence [14].

Thermal ablation is effective for lung metastases from various types of primary lesions in selected patients. However, there are no published results (e.g., overall survival, cancer-specific survival, and recurrent-free survival) of randomised control trials comparing thermal ablation and surgery or thermal ablation and best supportive care. To make this therapy one of the standard treatments for lung metastases, we need to establish the correct indications (e.g., primary lesion, tumour size, and tumour number) and prospectively prove its prolonged prognosis.

Figure legends

CT images of a lung metastasis in the right upper lobe in a 72-year-old man with history of resected left ureter cancer and two resected lung metastases.

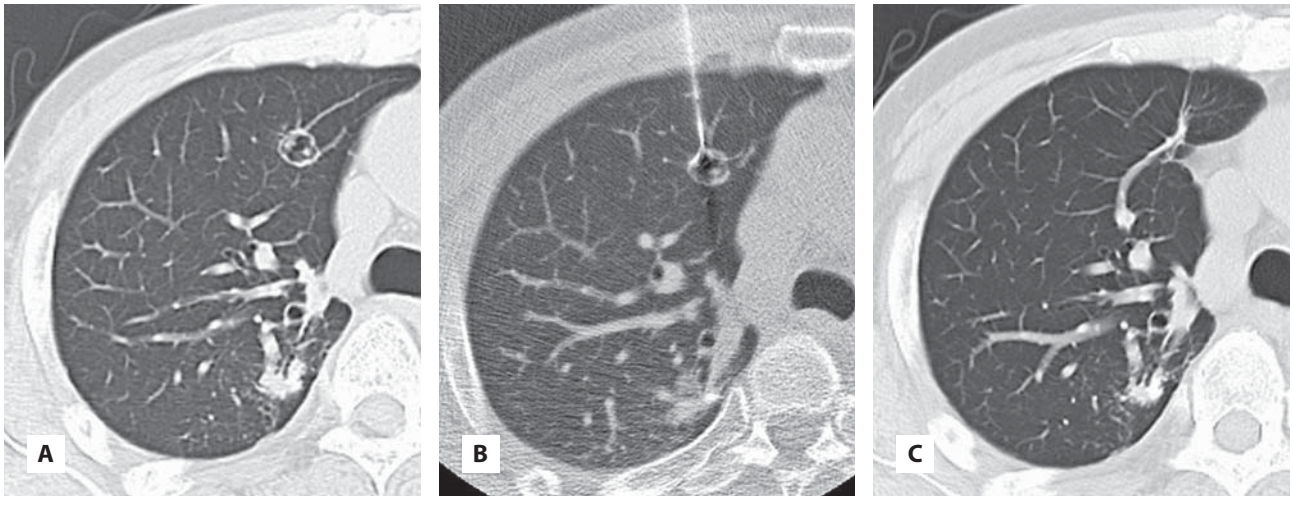

Figure A
CT before RFA shows a 1.3-cm thin-walled cavity that gradually increased and was diagnosed as a new lung metastasis.

Figure B
CT during ablation shows an inserted LeVeen™ Needle Electrode with a 3-cm array diameter into the metastasis.

Figure C
CT 10.5 years after RFA shows a scarred metastasis. Fortunately, he has no new metastasis after RFA.

Toshihiro IGUCHI
Okayama University, Okayama/JP

Toshihiro Iguchi graduated from Kochi Medical School in Nankoku, Japan, in 1998. Since then, he has worked in Japanese hospitals as a member of the Department of Radiology of Okayama University. In 2004, he worked with Dr. Yasuaki Arai and Yoshitaka Inaba at the Aichi Cancer Center in Nagoya, Japan. In 2017, he studied abroad for six months under Prof. Thierry de Baère at the Institut Gustave Roussy, Villejuif, France. He became an associate professor of the division of radiology at the Okayama University Hospital in 2019 and a professor of the department of radiological technology at Okayama University in 2021.

Since 2021, he has been an editorial board member of "CVIR" and "Diagnostic and Interventional Imaging". His research areas include interventional radiology and diagnosis of abdominal imaging, and he has published on the topics of image-guided ablation therapy for malignancy, biopsy, preoperative lung marking, the clinical use of new optical fibres that can raise temperature under high-precision temperature measurement, lowering radiation exposure in IR, the clinical use of 4D-CT and more.

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ECIO 2022 – DR. JACK JENNINGS

Catch his lecture during the MSK established indications session on Sunday, April 24, 15:00-16:30 CEST in the main auditorium!

Bone ablation for pain palliation: when and how

Bone is the third most common system involved by cancer metastases, and skeletal-related events, such as intractable pain due to direct osseous tumour involvement, pathologic fracture, and neurologic deficits as a consequence of nerve or spinal cord compression often unfavourably affects a patient's functional independence and quality of life. The spine is the most common site of osseous metastases, affecting approximately 40% of patients with metastatic disease. Considering the large health care economic burden, the limitations of therapeutic options including radiation therapy, systemic therapies, and surgery, as well as morbidity associated with osseous metastases, particularly in the spine, investigators have exploited and demonstrated the safety and effectiveness of minimally invasive percutaneous thermal ablation, which can be combined with vertebral augmentation/cementoplasty for pathologic fracture prevention and stabilisation, for the management of painful osseous metastatic disease.

To evaluate the "when" requires a thorough clinical evaluation done in a multi-disciplinary fashion in association with medical, surgical, and radiation oncologists. The most important questions to determine are: Is the lesion the aetiology of the patient's pain? How severe is there pain? What is their performance status? Is the patient's pain localised to one or a few discernible locations, or do they have diffuse pain? What is the patient's life expectancy and performance status? Is the pain local, mechanical, radicular or a combination? Is the lesion unstable and is surgical consultation necessary? Has there been prior radiation and or surgery? Are there underlying degenerative changes that may be the source of a patient's pain? Is ablation even necessary and will cement alone suffice for mechanical pain in weight-bearing bones? To answer these questions requires an in-person consultation with a complete history and physical examination. Other important considerations are lesion size and morphology, lytic, blastic, or mixed nature of the lesion, associated soft tissue component, vascularity, and involvement of weight-bearing bone, and proximity to vital structures (i.e. skin, nerves, spinal cord, vessels, cartilage, viscera and soft tissues). Cross-sectional imaging including MRI and CT is paramount to determine these characteristics, allowing for pre-treatment planning and determination if thermoprotective techniques will be necessary to avoid complications.

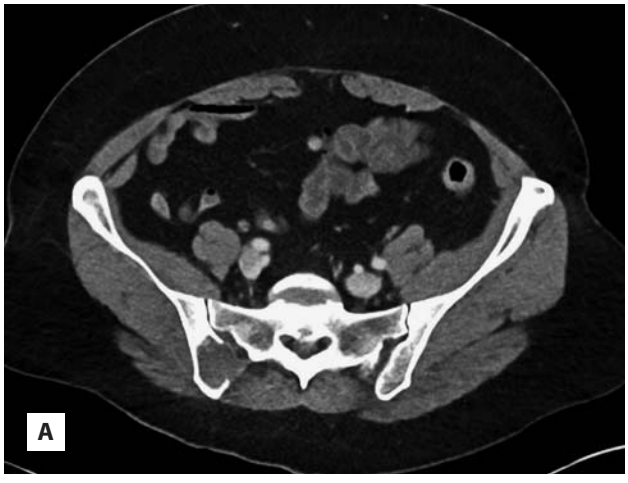
Once you get to the "how" more than half of the battle is over, as successful ablation of bone lesions for palliation is highly dependent on treating the appropriate patients and lesions. There are many tools in our armamentarium for percutaneous thermal ablation including radiofrequency, cryo-, microwave, and MR guided focused ultrasound ablation. Each modality has its advantages and limitations in the treatment of osseous lesions. Radiofrequency ablation (RFA) is the most published thermal modality for bone and is used primarily for lytic or mixed lytic-blastic bone lesions, geographic metastases with little or no extraosseous components, and challenging-to-access lesions (e.g. posterior central vertebral body and acetabulum) where access is feasible using navigational articulating electrodes. The main indications for the use of cryoablation for treatment of skeletal metastases include large tumours with complex geometry, bone metastases with large soft-tissue components, large tumours involving the posterior vertebral elements, paravertebral soft-tissue lesions, and blastic metastases. The use of microwave overlaps with both RFA and cryoablation including treatment of large tumours with complex geometry and osseous metastases with large soft-tissue components, osteoblastic metastases. It is increasingly being used in the treatment of spine lesions as well. MRI-guided high intensity frequency Ultrasound (HIFU) is a non-invasive form of thermal ablation for the treatment of skeletal metastases including primarily lytic or mixed lytic-blastic tumours with cortical disruption, extra-spinal osseous metastases, and bone tumours deeper than 1 cm from the skin surface.

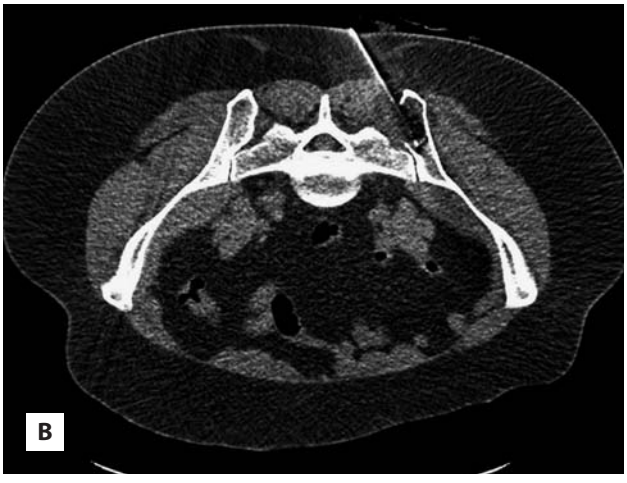
These all have unique technical advantages, including navigational RFA probes to treat challenging lesions, including the posterior vertebral body, and with thermocouples for real-time evaluation of the ablation zone. Cryoablation allows visualisation of the low attenuating ice ball on CT, simultaneous use of several

cryoprobes to achieve additive and sculpting overlapping ablation zones and availability of MRI-compatible cryoprobes. The advantages of microwave ablation include less susceptibility to the convective cooling effect and variable tumour tissue impedance resulting in more uniform and larger ablation zones, as well as heightened efficiency as compared with RFA, simultaneous use of multiple antennas to generate additive overlapping ablation zones, minimal risk of back-heating phenomenon in recently introduced antennas, and lack of contra-indication in patients with metallic implants. HIFU ablation allows for MRI-guided 3D visualisation for precise treatment planning, real-time monitoring of the ablation zone with MR thermometry and continuous thermal mapping. All of these modalities have proven to be safe with a low risk of major complications.

Familiarity of interventional radiologists with the thorough clinical and imaging evaluation and these interventional tools with progressive incorporation in clinical practice and continued technological advances will further advance the role of radiologists in the multi-disciplinary palliative management of patients with painful osseous metastases.

Figure legends





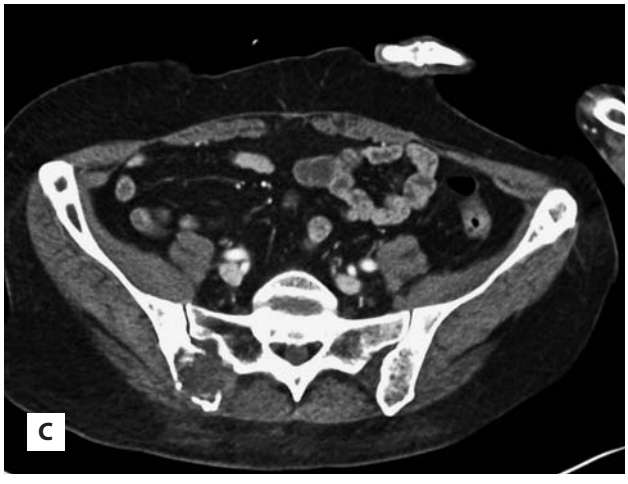


Figure A
53 yo female with metastatic synovial cell sarcoma admitted to hospital with painful right buttock pain and CT demonstrating a destructive lytic lesion involving the right posterior ilium.

Figure B
Intra-procedural images demonstrate 1 of 2 cryoablation probes within the lesion and a low attenuation iceball extending beyond the borders of the lesion.

Figure C
Patient had complete and durable pain resolution with follow up CT images demonstrating local control for greater than 2 years.

Jack JENNINGS
Washington University, MI/US

Dr. Jack Jennings is a Professor of Radiology at Washington University's Mallinckrodt Institute of Radiology and serves as the Chief of Musculoskeletal Radiology and Director of Musculoskeletal and Spine Intervention. He is actively involved in both interventional and interventional oncology societies in the U.S. and Europe and is a Fellow of CIRSE and ACR, serves as a board member of SIO, and is the President Elect for the American Society of Spine Radiology.

His main research interest lies in musculoskeletal and spine tumour ablation, bone and soft tissue biopsies, and osteoporotic and pathologic fracture treatment. He has been involved in multiple funded prospective studies and has been both the institutional and overall principal investigator on bone and spine tumour ablation trials.

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ECIO 2022 – PROF. MAXIME RONOT

Catch his lecture at the AI in IO session on Sunday, April 24, 15:00-16:30 CEST in Auditorium 2!

The current evidence for AI in IO – Is there a chance that it can change the way EBM is generated?

Medical imaging is a very active field of research on and development of AI tools. Patient scheduling, image acquisition and reconstruction, image quality analytics, radiation dose estimation, reporting, and data integration, although frequently overlooked, are being profoundly redefined and reorganised by AI. Closer to the medical activity of radiologists, a variety of tasks ranging from simple to complex (detection or interpretation of imaging findings, longitudinal analysis, imaging post-processing, prediction, prognostication, etc.) are subject to considerable ongoing research that is likely to reshape our medical specialty towards augmented-radiology.

In the field of interventional oncology, the potential applications of AI can be divided into pre-procedural (patient selection), peri-procedural (image registration, artefact correction, device selection, and recognition, guidance), and post-procedural (follow-up, prediction of response) [1,2]. Unfortunately, AI in IO is still in its early stages, and evidence supporting its value is scarce. Most results are derived from small-sized retrospective studies, lacking validation or clinical applicability. Nevertheless, these studies can be seen as proofs-of-concept or proof-of-principle, paving the road for more ambitious projects to come and exploring the unexplored in complex patient care possibilities.

While most studies focus on the possible value of AI for patient management (acting as triage, replacement, or add-on technology), one may wonder if its very existence may not lead to more profound changes in medical practice and research conduction, especially regarding the way evidence is gathered and consolidated. In other words, is there a chance that it can change the way evidence-based medicine is generated?

Evidence-based medicine is "the conscientious, explicit and judicious use of current best evidence in making decisions about the care of individual patients" [3]. It is based on a hierarchy of evidence (or levels of evidence) used to rank the relative strength of results obtained from scientific research. It is consensually considered that the highest level of evidence should be obtained from at least one properly designed randomised controlled trial. Unfortunately, most IO evidence is based on observational methods (cohort and case-control studies) that are considered to have little or no value. Consequently, IO studies are often criticised for their lack of solid scientific merit, especially when compared to pharmacological treatments. This perspective fails to acknowledge several well-described limitations of randomised trials (that may be unnecessary, inappropriate, impossible or inadequate), although all limitations can be, at least theoretically, overcome [4]. More importantly, it negates the peculiarities of non-pharmacological treatments. Indeed, an accurate and complete description of most non-pharmacological interventions is challenging. Interventions are usually complex, and each element or step possibly impacts the outcome. This results in difficulty in designing clinically relevant and standardised trials together with poor description and reporting of these interventions [5] that limit the replication of results. This may have severe consequences for patients' safety and is part of the agenda to reduce waste in clinical research [6]. Ongoing research on composite indicators covering entire intervention processes (e.g., textbook outcome), on adapting reporting systems (e.g., CONSORT-NPT) [7], or the recent increase in the number of prospective IO observational studies or registries, shall be seen as evidence of the growing awareness of these issues in the IO community, rather than mere proof of scientific illiteracy.

Artificial intelligence, especially machine learning, has many strengths that may be used to overcome some of the abovementioned limitations researchers face in the "factory of evidence" in general and in IO in particular. Additionally, it may also improve the way current EMB standards are designed and applied [8]. Machine learning techniques are agnostic and data-driven, with few assumptions around data completeness, accuracy, classification, and independence. They process a considerable amount of already available data sets to identify possible relationships between many variables that are not prespecified and have high diversity.

These data can be retrieved from multiple sources (electronic health records, administrative data, imaging data, genomic and proteomic databanks, social media, etc.) via natural language processing and automated data screening. This could not only improve data quality and exhaustivity in observation studies (which are very important for IO), but may also benefit randomised trials. Indeed, algorithms may improve patient selection (reducing population heterogeneity by leveraging electronic phenotyping, prognostic enrichment, predictive enrichment, estimation of individual risks) with direct implications for treatment allocation and stratification in trials [9]. In addition, it may redefine the randomisation process, improve statistical analysis of data, help validate causal inferences, create better reference standards (augmented pathology, imagomics), facilitate appointment scheduling, calculate more appropriate dosing regimens than current algorithms, help compare results from EMB with usual care to assess their applicability and validity in routine practice, facilitate meta-research (living network meta-analyses), or even simulate trials based on existing data. This is, of course, counterbalanced by the well-recognised limitations of AI (dependence of data quality, absence of risk of bias or quality of evidence rating, importance of context, limited explanatory power) which we need to collectively address.

In conclusion, artificial intelligence represents a formidable opportunity to build better IO evidence. Not only will it help address many flaws of observational studies and registries (especially in terms of data exhaustion) we need in IO, but it will help redefine the way high EBM is obtained. In return, to achieve "prime time" clinical application, AI will need to submit to the highest standards of evaluation EBM offers. It is our responsibility to facilitate and structure this virtuous circle.

Maxime RONOT
Beaujon Hospital, Paris/FR

Dr. Ronot is a Professor in the Department of Radiology at the Beaujon Hospital (Université de Paris, France). His tumours, and interventional abdominal oncology. He is part of the CIRSE AI task force and a member of the LI-RADS AI workgroup. He is a fellow of the ESGAR and serves as president of the French national ethics committee for medical imaging research.

Dr. Ronot is associate editor of the Journal of Hepatology, abdominal radiology, section editor of European Radiology, and deputy editor of Diagnostic Interventional Imaging. He authored and co-authored more than 250 articles in peer-reviewed journals. You can follow him on twitter at @maximeronot.

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ECIO 2022 – DR. JEAN-FRANCOIS GESCHWIND

Catch his lecture during the Research and clinical studies session on Monday, April 25, 17:00-18:30 CEST in Auditorium 2!

The role of contract research organisations in clinical trials

It is difficult nowadays to imagine clinical trials being conducted in oncology without contract or clinical research organisations (CROs), but the involvement of such organisations was not always the case. At first, in the early 1980s, CROs were highly specialised entities that provided consulting services on an as-needed basis, such as regulatory advice or support in view of a submission to the Food and Drug Administration (FDA), biostatistical expertise, clinical site support, and/or safety monitoring, among others. Gradually, over the last 40 years, CROs have evolved into large full-service organisations that have become indispensable in the conduct of clinical research by providing research and support services to the pharmaceutical and device industry itself, seeking to reduce risks and costs associated with the development of new products.

Given the high costs of complying with drug or device development regulations, it is almost impossible to contemplate bringing a new cancer drug or device to market without engaging the services of a CRO. As such, CROs are used to select both investigators and clinical sites, assist with patient recruitment, audit sites, provide safety surveillance and reporting, manage data, guide regulatory and biostatistical strategies, and in some cases, CROs are also capable of acting as imaging core laboratories to function as blinded central independent reviews (BICR) that are so critically important when drugs or devices are considered for regulatory approval. In the end, a sort of symbiotic relationship has formed between the pharmaceutical and medical device industry and CROs, as most of the regulatory burden has shifted to CROs and the ethical risks and responsibilities inherent in the conduct of clinical research are now largely assumed by CROs. This is because, unlike the drug or device makers, CROs are not conflicted by the outcome of studies, but like them, CROs are equally burdened by and subjected to the heavy regulations imposed by the federal government, the states when applicable, and their own operating procedures. In truth, one can wonder whether such a regulatory burden is not the real reason that led the pharmaceutical and device industry to engage CROs to conduct their clinical trials, so much so that CROs are increasingly the "face" of clinical research.

This greater visibility of CROs in the management of clinical trials has led to frequent interactions between investigators and CRO personnel to address all sorts of queries to ensure that clinical trials are obeyed by the strictest criteria. After all, this is how CROs are judged and evaluated – by their ability to deliver high-quality services in a timely manner and most importantly by adhering to the clinical protocol and regulatory requirements guaranteeing the validity of the data in the process. As a result, since CROs can be subjected to comprehensive audits by virtually anyone involved in a study, from the sponsor to the FDA and any other regulatory agency in between, CROs have become the ultimate de facto "guarantors" of data integrity. The responsibility is immense and requires extreme vigilance at every stage of the process. Thus, it is probably fair to say that without CROs, the rigour needed to conduct clinical research and complete clinical trials would be lacking.

Yet, it is also undeniable that the costs of bringing new potential effective therapies to approval and the clinical setting are exorbitant and are continuing to climb with no end in sight largely due to excessive and perhaps unnecessary regulation. As a result, researchers, scientists, and oncologists alike have openly questioned the need for CROs, as they view them as a major source of additional financial costs and regulatory burden. Although the causes for the substantial time and costs associated with the conduct of a clinical trial are multifactorial, CROs should not be blamed. Instead, they should be supported by investigators so that many aspects of the everyday tasks of a CRO can be expedited and eased. Since CROs are mostly in the business of data collection and documentation, it is imperative to facilitate this process. Therefore, high-quality CROs have the potential to add substantial benefit to the conduct of a clinical trial, from improving the quality of data collection to trial standardisation. The stakes are high, as new therapies for cancer patients are critically needed, so it is imperative that everyone works together to remedy the current issues and provide solutions that will streamline the running of clinical trials which is the only path to a new treatment approval.

Jean-Francois Geschwind
USA Clinics Group, Northbrook, Il/USA

Dr. Jean-Francois (Jeff) H. Geschwind is currently the Director of Oncology at USA Clinics Group; the Medical Director for Oncology and Image-Guided Therapy at Syntactx/NAMSA, a contract research organization based in New York City; Senior Scientist for Clinical and Scientific Affairs, Imaging Endpoints, LLC, a contract research organization specialized in imaging; and a consultant for Cage Pharma, previously PreScience Labs, a company he founded in 2009 which is focused on developing cancer drugs targeting tumour metabolism, specifically glycolysis. He is also a scientific consultant for Philips Healthcare advising them on all matters related to oncology and image-guided therapy.

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ECIO 2022 – DR. FRANCESCO DE COBELLI

Catch his lecture during the HCC: beyond the guidelines session on Monday, April 25, 17:00-18:30 CEST in the main auditorium!

Combined immunotherapy and interventional oncology in HCC

A vast array of treatment options is available for hepatocellular carcinoma, ranging from surgical resection or thermal ablation of early disease to intra-arterial and systemic therapies for intermediate and advanced stages with the potential ultimate goal of liver transplant.

The updated ESMO recommendations published in 2021 [1] and the most recent 2022 BCLC update strategy for prognosis prediction and treatment recommendation [2] also acknowledged systemic immunotherapy for first-line treatment of advanced-stage HCC (BCLC C). The rationale lies in the biology of HCC, an immunogenic tumour expressing tumour-associated antigens and gene-specific neo-antigens. Drugs currently investigated for systemic immunotherapy of HCC target inhibition of immune checkpoints, i.e. molecules whose physiological function of setting a limit to cell-mediated immune response is exploited by the tumour to escape anti-tumour surveillance. However, response to systemic immunotherapy may be limited in some patients due to the immune suppressive microenvironment observed in the chronically-inflamed liver, particularly in the setting of non-viral hepatitis.

Immunosuppressive factors in the HCC microenvironment provide the rationale for combining systemic immunotherapy and interventional oncology. Both ablative and intra-arterial treatments for HCC trigger release of tumour-associated antigens (TAA) and damage-associated molecular patterns (DAMP) with subsequent activation of antigen presenting cells (APCs) and production of anti-tumour CD8+T cells, a process termed "immunogenic cell death" [3-5]. Response to locoregional treatments and decreased recurrence have been associated to higher frequency of circulating tumour-specific T cells, increased expression and activation of cytotoxic surface markers 4-weeks after RFA [6]; higher AFP-specific CD4+ T-cells following TACE/TAE [7]; and increase in TAA-specific T-cells 2-4 weeks after RFA [8].

The principle of associating systemic immunotherapy with locoregional interventional oncology is to achieve a synergistic effect whereby better tumour response rates and improved survival may be obtained in advanced HCC patients. Currently, a number of ongoing trials are investigating the use of immunotherapy alone or in combination with another biological agent in association with a locoregional treatment in patients with HCC [9].

Available results

A pilot investigation conducted by Duffy et al. [10] on patients with advanced refractory HCC treated with a CTLA-4 inhibitor (tremelimumab) combined with ablation (RFA or Cryoablation) or TACE showed efficacy and safety with a median time to progression of 7.4 months. Only patients with increase in CD8+ T cells at six-week tumour biopsies had a clinical benefit. The IMMUTACE study investigated TACE followed by systemic treatment with an anti-PD 1 (nivolumab) on intermediate stage HCC patients and showed an overall response rate (ORR) of 70% and a median overall survival of nearly 20 months [11].

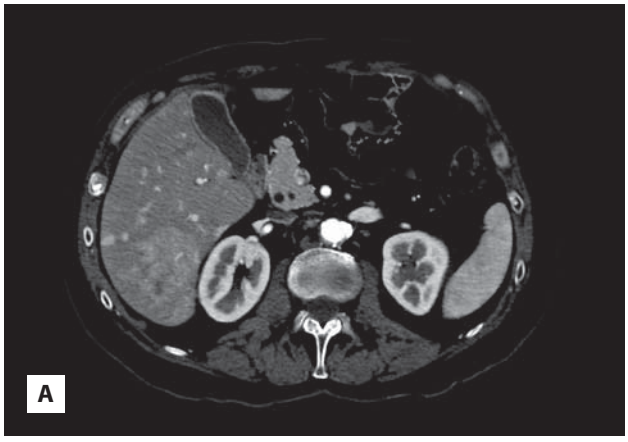
An additional treatment option in patients with intermediate-to-advanced disease stage HCC due to its ability to induce cell death for as long as 6 months is trans-arterial radioembolisation (TARE), currently of great interest in the setting of combined therapies for HCC. The NASIR-HCC single arm study evaluated transarterial Yttrium-90 radioembolisation (TARE) with resin spheres plus nivolumab in HCC patients in multiple centres in Spain [12] and showed a response rate of 40%. The recent CA 209-678 study also investigated Y90-radioembolisation in patients with advanced HCC followed by nivolumab and resulted in an "encouraging objective response rate*"* [13]. Currently, one study is recruiting patients with unresectable HCC for treatment with combined systemic therapy plus TARE (NCT04541173); progression-free survival will be investigated following TARE alone vs TARE followed by atezolizumab plus bevacizumab. Secondary endpoints include safety, time to progression, overall response and overall survival.

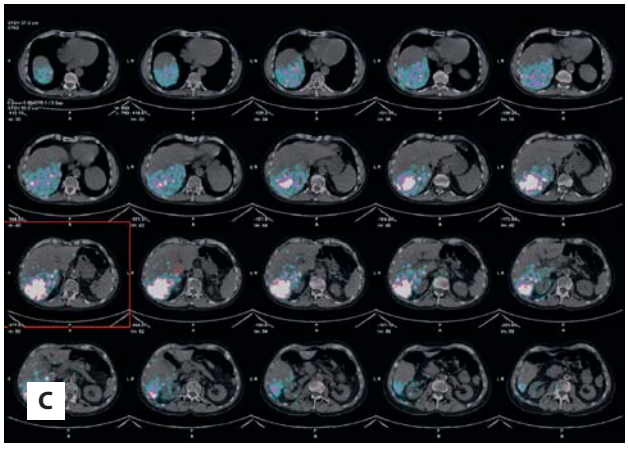
While most ongoing studies are investigating the addition of systemic therapy following interventional oncology techniques in a quasi-"adjuvant" setting, another interesting theoretical application of combined schemes

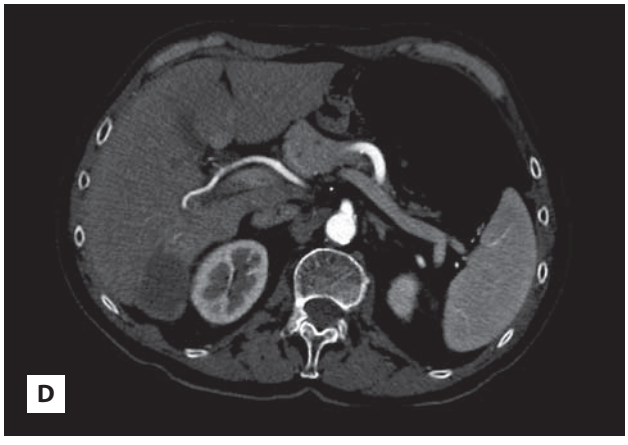
could be to take advantage of the high response rate shown by systemic therapies to downsize the disease and allow local therapy to exert a curative effect.

The steps to providing robust evidence are still numerous and the time needed is long. Particular interest lies in defining the ideal time schedule of combined schemes and biomarkers for selection of ideal candidates.

However, the data available point in a promising direction in responding to clinical needs and ameliorating patient outcome.







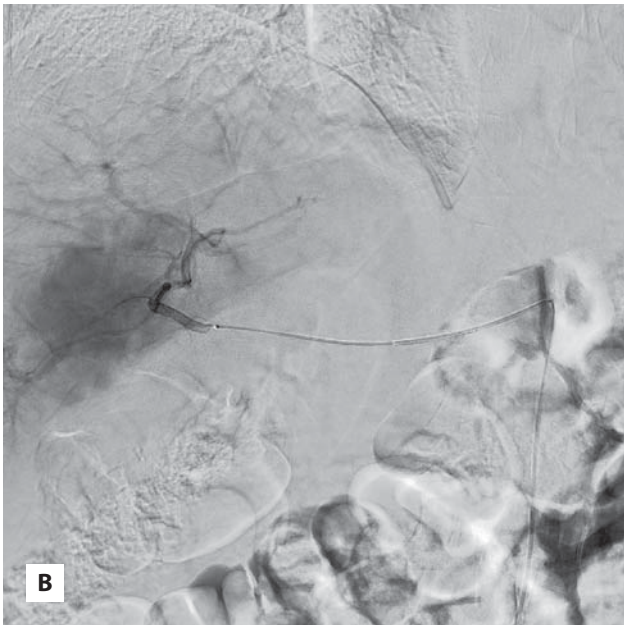


Figure legends

Figure
77-year-old patient with 6 cm HCC in segment VI and multiple foci of HCC in both liver lobes treated with a combination of transarterial Yttrium-90 radioembolization (TARE) plus immunotherapy.

Figure A
Contrast-enhanced CT scan at diagnosis.

Figure B
Superselective angiography.

Figure C
PET-CT scan obtained after infusion of Yttrium-90 resin microspheres.

Figure D
Contrast-enhanced CT obtained after 9 months shows tumor necrosis with complete response.

Francesco De Cobelli
San Raffaele Vita-Salute University Hospital, Milan/IT

Prof. Francesco De Cobelli is full professor of radiology and currently the chair of the Department of Radiology at the San Raffaele Vita-Salute University Hospital in Milan, Italy. He is also the director of the postgraduate school of radiology and co-director of the international PhD course in clinical and experimental medicine at the same university.

In recent years, his clinical and research activity has been primarily focused on interventional oncology and oncologic imaging, in particular image-guided treatment of hepatic lesions and kidney tumors, as well as promoting multimodality and multidisciplinary treatments.
He is currently the Vice-President of the Italian College of Interventional Radiology (ICIR) of the Italian Society of Medical and Interventional Radiology (SIRM). Prof. De Cobelli is the author or co-author of 314 publications with an h-index 46 and more than 9,800 citations (Scopus).

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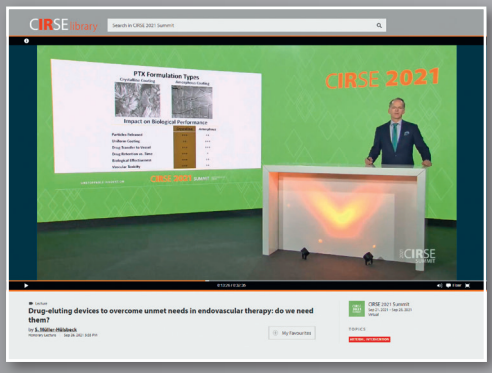

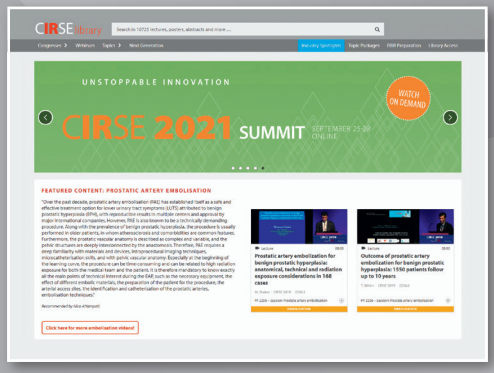

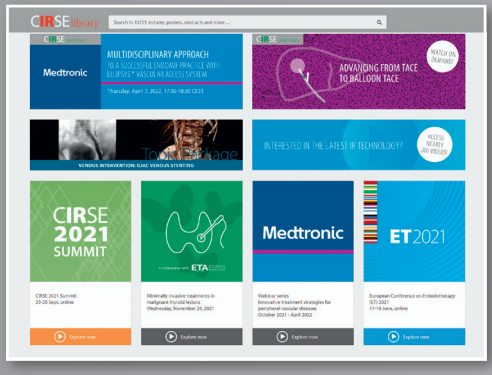

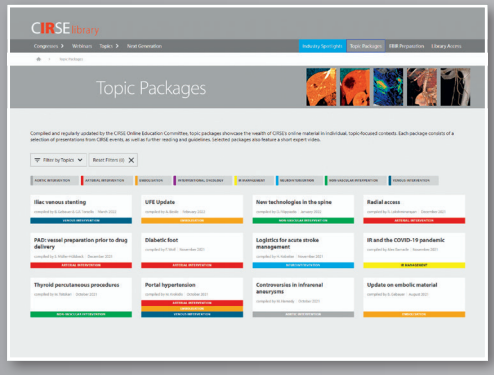

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Catch his lecture during the Meet the PI: upcoming research session on Sunday, April 24, 10:30-12:00 CEST in Auditorium 2!

Meet the PI: the CRYOMUNE study

Cryomune (NCT04339218) is the first randomised study investigating the added value of cryoablation combined with immune checkpoint inhibition in patients with advanced non-small cell lung cancer NSCLC. For several decades, effective treatment options had been limited for patients with metastatic or locally advanced NSCLC. Platinum-based doublet chemotherapy had been the standard of care for first-line treatment.

However, the treatment of NSCLC has evolved significantly over the past decade, as a result of much better understanding of the molecular biology of the disease.

On one hand, tumour subtypes whose malignant phenotype is the result of oncogenic driver mutation and gene re-arrangements are susceptible to targeted therapies and demonstrate relatively better prognosis. Those tumours are particularly frequent in non-smokers.

On the other hand, a large majority of diagnosed NSCLC do not exhibit specific targetable genetic aberration. Those tumours, most frequent in smokers or former smokers, present higher mutational load, poorer prognosis and have been treated with standard chemotherapy regimen until the recent development of immune checkpoint inhibitors (ICI) based immuno-therapy.

Immunotherapy

From the inception of carcinogenesis, the immune system detects and eliminates nascent tumours in a process described as cancer immune surveillance. Tissue disruption and unscheduled cell death lead to the release of neo-antigens and signals that activate both innate and adaptive immunity.

However, cancer cells ultimately evade immune control. Cancer immunotherapy aims at restoring the ability of the immune system to efficiently detect and eliminate tumour cells.

Novel antibodies that target programmed death-ligand 1 (PD-L1) and program-death-1 (PD-1) pathways represent an important advance in the management of advanced and metastatic NSCLC. The PD-1 receptor, which is expressed on activated T cells, is engaged by ligands PD-L1 and PD-L2, which are expressed by tumour cells and infiltrating immune cells. Tumour PD-L1 expression is prevalent in NSCLC and promotes tumour immune escape. ICI aim at disrupting PD-1/PD-L1 signalling and restoring antitumour immunity.

Pembrolizumab, a monoclonal antibody targeting PD-1, prolonged overall survival with a favourable benefit-to-risk profile in patients with previously treated, PD-L1-positive (>1%), advanced NSCLC. Later on, pembrolizumab was associated with significantly longer progression-free and overall survival and with fewer adverse events than was platinum-based chemotherapy in patients with advanced NSCLC and PD-L1 expression on at least 50% of tumour cells (Reck et al, N Engl J Med 2016).

Thus, as of May 2017, pembrolizumab is authorised in the first-line treatment of advanced and metastatic NSCLC for tumours with PD-L1 expression on at least 50% of tumour cells.

Study rationale

Immunogenic cell death through cryoblation

One of the most effective immune-stimulating methods to completely eradicate a human disease is a vaccine. Co-stimulating the immune system with a shower of tumour antigens via cryosurgery in the presence of a "primed" immune system pre-treated with CTLA-4 and PD-1 combined therapy would theoretically result in a synergistic effect of local tumour and distant metastases regression, or abscopal effect. The release of tumour antigens is analogous to a polyvalent, auto-inoculation of tumour self-antigens, and can be considered an auto-vaccine.

The abscopal effect was identified over 50 years ago and refers to the phenomenon following radiation therapy of a primary tumour which results in regression of distant metastatic lesions. This is presumably due to the release of tumour-specific iso(self)-antigens into the patient's circulation and the immune response that manifests thereafter. Indeed, there now exists numerous reports in the literature where the abscopal effect has been observed when patients who were previously treated with CTLA-4 and PD-1 antibodies subsequently received radiation therapy, and their distant metastases regressed. This abscopal effect is believed to be mediated by the development of a systemic antitumour immune response caused by radiation therapy, which releases intratumoral antigens adjacent to APCs and T-cells; quite similar if not identical to the immune response resultant of cryoablation. Notably, cryoablation has fewer adverse events associated with its use compared to radiation and may provide for a more comprehensive and efficient release of self-antigens into circulation. Cryosurgery likely preserves these self-antigens whereas radiation, radiofrequency, and microwave therapy denatures and destroys some of these circulating tumour epitopes.

Unlike radiation therapy, cryoablation results in direct cell death by removing heat. Presumably, the degree of disparity in targeted immune activity is because radiation-based methods cause protein denaturation, decreasing the quantity of undamaged antigens released into circulation. Freezing alternatively preserves cellular ultrastructure and increases plasma membrane permeability, causing the discharge of intracellular debris. Currently, the efficacy of cryotherapy combined with ICI in advanced NSCLC has not been explored and is unknown.

Cryomune is a randomised comparative phase III trial aiming to compare the one-year survival benefit between two therapeutic strategies: cryoablation of one tumour (except liver and brain metastases) with pembrolizumab and pemetrexed-carboplatin versus pembrolizumab and pemetrexed-carboplatin in metastatic lung adenocarcinoma patients. Thanks to a strong translational program (sequential tumour and blood sampling), we will be able to assess the impact of such an approach on the tumour microenvironment.

Jean Palussière
Institute Bergonié, Bordeaux/FR

Dr. Jean Palussière is an interventional radiologist at the Institute Bergonié in Bordeaux, France. After completing his medical studies at Bordeaux University, he spent a one-year sabbatical in northern Congo, before working as an assistant for two years in the vascular radiological department in Bordeaux once again. While there, he also worked to develop IR at the Institute Bergonié and in 1999, the first angiosuite was installed.

In 2002, Palussière and his team began treating their first patients with radiofrequency ablation for lung tumours. Due to his expertise in thermal lung and breast tumour ablation, Dr. Palussière has been a guest speaker at different universities and conferences across Europe and the USA, and served as the ECIO 2016 Honorary Lecturer.

ECIO 2022 – PROF. GERARD O'SULLIVAN

Catch his lecture during the emergencies in IO session, Wednesday, April 27 at 08:30 CEST in Auditorium 2!

Venous emergencies

Most interventional radiologists and vascular specialists are familiar with arterial emergencies, as we perform arterial interventions frequently, and we see catastrophic events more commonly in arteries than in veins. Traumatic arterial cases, in particular, demand immediate action, and between coils, plugs, glue, stent grafts and occasionally open surgery, the problem can be swiftly dealt with – and the intervention is usually life-saving.

By contrast, venous emergencies are less common, and as a result, most of us are less well prepared to deal with them.

Unfortunately, as I specialise in deep venous reconstruction, I have probably had more than my share of these, and experience can be a harsh mentor. The purpose of this lecture is to show you some examples of the problems you may face; how you need to prepare for them, in which of your patients they are more likely to occur, and how you have to react to rescue the situation.

Many of the basic tenets of venous interventions are similar to those in arteries; including good pre-operative imaging, secure access to the vascular tree, safe wire passage, balloon dilatation, stent implantation and so on. However, there are some critical differences: symptoms are harder to pin down, and thrombus may be more chronic than initially thought. The direction of flow is the opposite to that seen in the arterial circulation, and so objects (thrombus, coils – even stents) migrate to the right atrium or pulmonary arteries rather than peripherally. Vein walls are more resistant to balloon dilatation than arteries, requiring HIGHER rather than lower balloon inflation pressures, and the diameter of the balloons employed are often very different. Neo-intimal hyperplasia is not a factor, but still does occur in stent re-stenosis.

The CIRSE library has an extensive list of videos on this very topic, and readers are strongly encouraged to review them and learn from these experts.

My lecture at ECIO 2022 will cover the following points

- Identification of potentially "problem patients"
- How disaster-ready are you?
- Central venous access disasters
- Venous reconstruction disasters
- Venous thrombectomy and thrombolysis disasters

Potentially problem patients:

Uncertain clinical history or poor historians; unexplained shortness of breath, remote history of DVT or PE; multiple miscarriages, abdominal scars with no explanation – all of these are potential banana skins. You need to prove that unexplained shortness of breath is NOT due to pulmonary hypertension.

Disaster readiness:

- This is an integral part of airline pilot training. How ready are you and your team if something goes wrong?
- What size IV line does the patient have?
- Is the patient group and cross matched; or group and held?
- Any allergies?
- Are you ACLS certified?
- Are you even BLS certified?
- Do you know the numbers of your on-call arrest team/ blood bank/anaesthetic team?
- Do you know where the stent grafts are kept?
- Do you have the right size sheaths?
- And so on…

The rest of the lecture is a series of disasters that have occurred to my patients or those of my colleagues; sometimes the situation was remediable – sometimes not. Why not learn from my mistakes rather than making them yourself?

Gerard O'Sullivan
University Hospital Galway, Galway/IE

Prof. Gerry O'Sullivan is a consultant interventional radiologist at the University Hospital, Galway. He completed his basic training in radiology in Plymouth and St. George's, London, before completing an IR fellowship in Stanford under Mike Dake, and worked as a consultant in Chicago before moving to Galway in 2002. He specialises in vascular procedures, and is particularly well known for his expertise in the venous field, especially DVT.

In this respect, Dr. O'Sullivan has been a regular faculty member at CIRSE meetings, actively participating in debates, lectures, panel discussions and workshops each year since 2006. He is currently the Chairperson of the Membership Committee.

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ECIO 2022 – DR. FERNANDO GÓMEZ MUÑOZ

Catch his lecture during the session "New fields: paediatrics", Tuesday, April 26 at 10:30 CEST in the main auditorium.

Pushing the boundaries: paediatrics

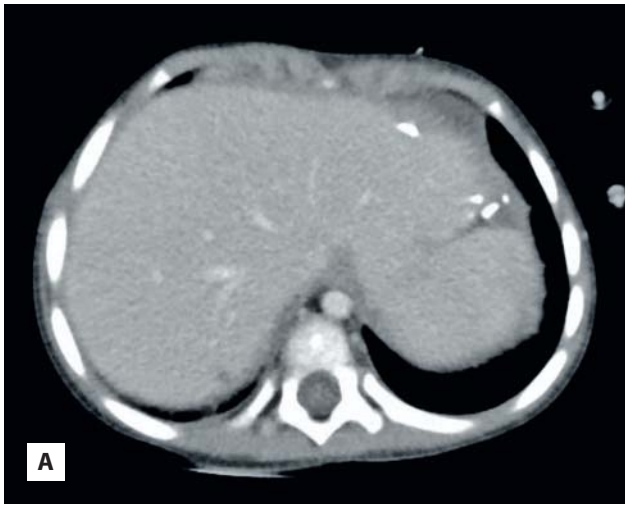
Paediatric cancer is a rare disease that has significantly improved in prognosis since the 50s and 60s. There has been a shift from only about 30% of children suffering from this disease being cured in the past to more than 80% of cases today being curable [1]. Obviously, 80% is not 100%, and this means that we are still not solving a problem that causes great suffering and has a huge emotional impact on patients and relatives. Furthermore, this improvement refers mainly to non-solid neoplasms, leaving enormous room for improvement in solid cancers, the type of cancer in which interventional oncology (IO) is usually more involved.

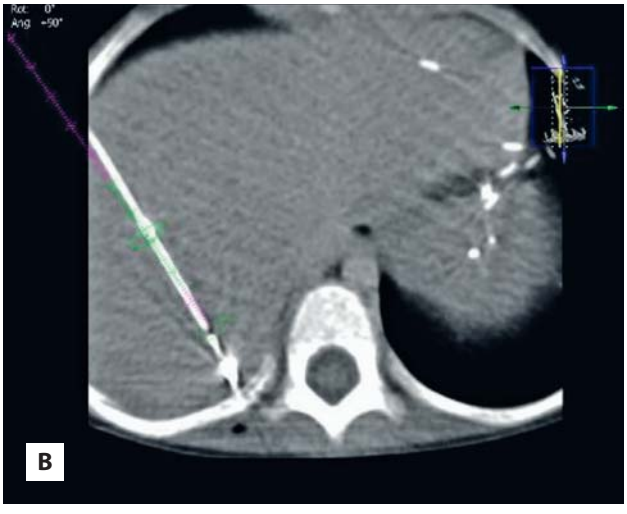
Adult cancers are classified by the anatomical site of the primary tumours, but cancers in children are classified by histology into 12 major groups by means of the International Classification of Childhood Cancers (ICCC). Embryonal cancers, retinoblastoma, neuroblastoma and hepatoblastoma are dominant in younger children.

The most prevalent malignant solid cancers in adolescents are extracranial germ cell tumours (GCTs), bone and soft tissue sarcomas, melanoma and thyroid cancer [2].

The role of IO in paediatric cancer, in general, is several steps behind interventional oncology in adult patients [3]. There are quite a lot of reasons for this, including that virtually all of the devices that we commonly use in adults are off-label for children (regardless of their size and weight), that these devices are thought for adult patients, and that paediatric cancer does not represent a financial appealing opportunity for the industry due to how uncommon it is.

Another problem that IO for children faces is that most of these patients are managed following protocols dictated by international oncology groups, and it is usually difficult to reach ethical approval or support from other specialties for research trials (can you imagine a trial in Europe





comparing percutaneous ablation vs surgery in a 3 cm liver tumour for children between 0 and 3 years old when surgery is curative, even if it is more aggressive?). Finally, the rarity of the disease limits the chances for gathering the required number of patients in many scenarios, and in many cases, there are already ongoing trials that can potentially be competitive.

Nevertheless, not everything in paediatric IO is a weakness or a threat. As previously mentioned, there is a lot of space to improve patient care. We have learnt several lessons from the adult IO world showing the efficacy of our endovascular and percutaneous approaches in tumour control [2,4,5]. Percutaneous thermal ablation has been demonstrated to be effective in treating lung metastasis from sarcomas [6], slowly evolving ganglioneuromas tumours may benefit from conservative approaches instead of surgery, and benign aggressive bone lesions have shown an excellent response to ablation[7]. Immunotherapy has improved survival in some paediatric cancers [8] and it is worth investigating its potential synergy with cryoablation or other modalities [9]. Doxorubicin or Irinotecan are commonly used for the treatment of haepatoblastoma or Wilms tumour, and we all know that we can administer these drugs locoregionally in an attempt to reduce the systemic dose, thus reducing toxicity [10,11]. Chemoembolisation and radioembolisation are increasingly being used in chemorefractory patients, or as a bridge, or with an attempt to downstage children for liver transplantation [2].

We have very good examples of cooperative work from the International Society of Pediatric Oncology (SIOP) and the Children´s Oncology Group (COG). Paediatric IO is actively getting involved in these societies, and specific groups or subgroups are being created.

The Society for Pediatric Interventional Radiology (SPIR) is putting forth efforts to create structured registries that will not only allow us to show safety and efficacy at a larger scale but also allow us to use the available artificial intelligence tools to analyse and extract information that, just a few years ago, required larger cohorts or complex trials.

We still have a lot of work to do, and hope that motivation and passion will continue to fuel all interventional radiologists dedicated to oncology in general and paediatric oncology in particular.

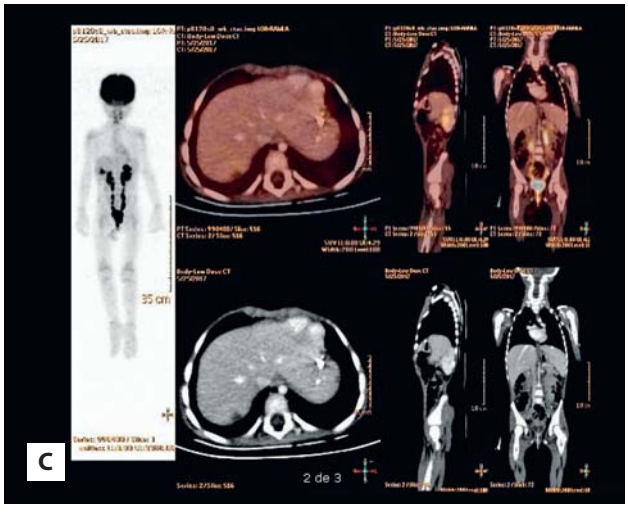


Figure legends

Figure A
GCT liver metastasis in segment VII in a 4-year-old girl.

Figure B
MWA antenna insertion after hydrodissection of the diaphragm.

Figure C
PET-CT image evaluation after 3 months showing no uptake in the lesion.

Fernando Gómez Muñoz
Hospital Clinic of Barcelona, Barcelona/ES

Dr. Fernando Gómez Muñoz is a medical specialist in vascular and interventional radiology. He earned his credentials from the University of Valencia and completed his residency in Valencia, also performing IO focused rotations at the Bergoniè Institute in Bordeaux and at the Hospital Clinical in Barcelona. As a CIRSE Fellow, he trained in paediatric interventional radiology at the Great Ormond Hospital in London, UK.

He is currently the head of section at the Antoni van Leewenhoek-Netherlands Cancer Institute in Amsterdam, the coordinator of Interventional Oncology at the Sant Joan de Deu Children's Hospital in Barcelona, and is on the board of directors of the Society for Pediatric Interventional Radiology.

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Catch the corresponding lecture in the session on IO for non-colorectal metastases, Tuesday, April 26 at 08:30 CEST in the main auditorium.

Local treatment of breast cancer liver metastases (BCLM)

Breast cancer is one of the leading causes of mortality worldwide [1]. It is a heterogeneous disease with different molecular subtypes, different prognoses and different responses to treatment. The most common site of metastases are liver, lung, bone and brain, with the liver being the second most common site of metastases. The liver is the primary site of breast cancer metastases recurrence [2] in about 10% of patients. Currently, there is a rapid advance in systemic treatments of different tumours including breast cancer, however, the overall survival remains disappointing, with a median survival of 22-26 months with chemotherapy alone, together with no reported 5-year survival and a 37% 5-year survival after the introduction of anti-HER2-therapy [3]. During the last decades, the oncologic mindset was that BCLM are unresectable at diagnosis and the patient should undergo systemic treatment exclusively. Recent studies, however, were able to show that subgroups of patients with oligometastatic disease have better survival rates after local or loco-regional treatments compared to systemic treatments alone [4]. Surgical resection seems to improve survival in a highly selected patient cohort (young at diagnosis, small tumour size, no extrahepatic disease) [3].

Interventional management of BCLM is still in an early stage of its development, especially in determining the indications for the different local or loco-regional therapies. Besides a good knowledge of the different therapies, multiple criteria (tumour biology, response to CTx, hormone receptor status, extent of the disease) have to be taken into account for the identification of the ideal candidate for a multimodal, multidisciplinary treatment to maximise patients´ benefit. For all different interventional oncologic procedures (MWA, RFA, TACE, TARE) there are several studies proving the safety and efficacy of each option [2, 3].

Bale et al [2] published a review showing the different options and results of percutaneous thermal ablation. In this review article, the median overall survival after RFA was up to 60 months and the 3 and 5-year overall survival rates were 70% and 30% respectively.

These numbers are comparable to the OS after surgery – however, with a smaller complication rate, a shorter stay in hospital and a lower morbidity and mortality rate. Another possible indication for liver thermal ablation is the use as a test-of-time approach – by applying thermal ablation as an initial treatment to avoid unnecessary surgical treatment in patients who would develop metastases in the further course of the disease [2].

In contrast to curative percutaneous options, transarterial therapies are more palliative. In spite of multiple publications dealing with TACE and TARE in HCC or metastases of colorectal cancer, the data regarding its use in BCLM are sparse.

In a recent systematic review [5] the presently available evidence for intraarterial therapies was summarized. The review summarized 26 studies with 1,266 patients and showed pooled response rates as high as 49% for TARE, 34% for TACE and 19% for chemoinfusion. The pooled overall survival given in the review [5] was 9.2 months for TARE, 17.8 months for TACE and 7.9% for chemoinfusion. The longest median overall survival was reported if the transarterial therapies were combined with systemic chemotherapy, being as high as 47 months for TACE and 49 months for TARE6 (Fig 1 a-d). These results are amazing because these therapies were only performed in patients suffering from chemorefractory (!) disease. Therefore – these transarterial therapies could be of major interest in patients with chemorefractory advanced liver metastases.

Besides the need for further studies to identify subgroups of patients with a benefit of this multimodal treatment, every patient has to be discussed in a multidisciplinary tumour board.

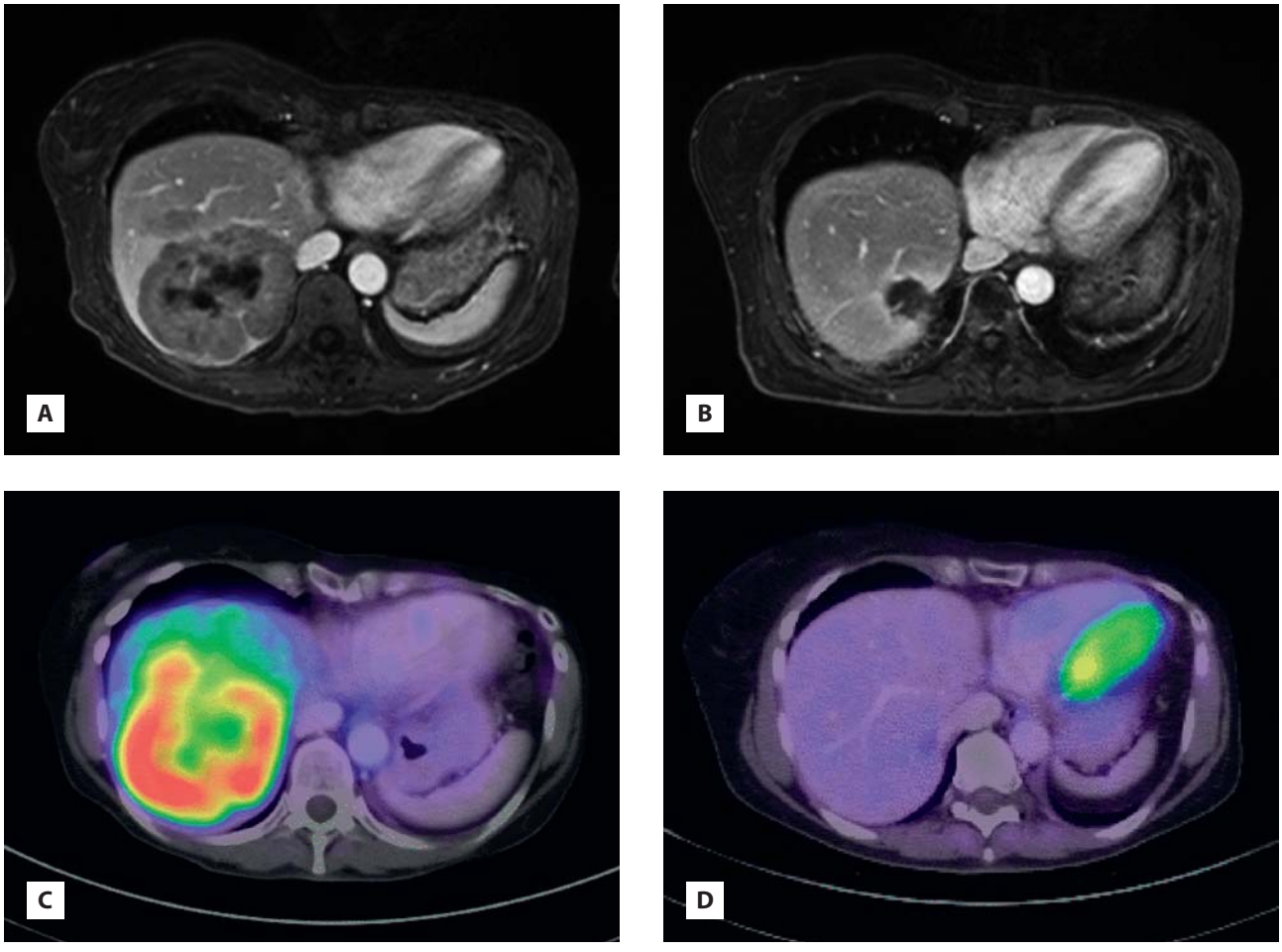

Figure legends

Figures 1a-d
52-year-old female patient suffering from a solitary (!) chemorefractory huge metastasis in the right liver lobe. The decision was made in the tumour board to perform a TARE in an individual approach. Complete response was reached, shown by the contrast enhanced MRI and the PET CT in the 3 months follow up.

Ralf-Thorsten Hoffmann
University Hospital of Dresden, Dresden/DE

Prof. Dr. Ralf-Thorsten Hoffmann is a full professor of radiology and the chairman of the „Institute and Policlinic for Diagnostic and Interventional Radiology" at the University Hospital of Dresden since 2018. He is fellow of CIRSE and ESGAR and he is part of the executive committees of DEGIR (The German Society of Interventional Radiology) and ESOI (The European Society of Oncologic Imaging). He has a special interest in interventional radiology with a clinical focus on hepato-biliary interventions including TIPSS, oncologic interventions, UFE, PAE and the treatment of lesions of the bones.

For years his scientific focus has been on interventional oncology. Besides teaching students and young radiologists, Prof. Hoffmann is intensely involved as an instructor for interventional radiology and he has trained multiple residents and young consultants in the different fields of IR.

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Catch the corresponding lecture at the session "Imaging-guided local tumour treatment with curative intent" on Wednesday, April 27 at 08:30 in the main auditorium.

Optimal ablation zone assessments

Improved tumour depiction for accurate targeting followed by optimal ablation zone (AZ) and minimal margin (MM) assessments are critical for tumour ablation success and optimization of resulting oncologic outcomes. Thermal ablation (TA), including radiofrequency (RFA) and microwave (MWA) ablation, destroy cancer cells in situ using cytotoxic levels of thermal energy, with minimal risk. Guidelines recommend TA as a stand-alone therapy or in combination with surgery, provided that all visible disease is eradicated. A residual viable tumour (VT) may remain undetected by current imaging, leading to local tumour progression (LTP), and this has limited the widespread use of TA.

MM > 5 mm is the most important technical factor to achieve acceptable local tumour control after TA [6–12]. Accuracy of AZ assessments, improved sensitivity of MM measurement and prediction of LTP are critical for TA success. Dedicated 3D software has improved sensitivity and discrimination value for the detection of the MM and prediction of LTP, compared to anatomic imaging and manual measurements. Real-time metabolic imaging used for ablation with the "split dose" technique administers 1/3 of the diagnostic FDG dose, sufficient for tumour imaging and targeting; and the remaining 2/3 upon completion of TA, to assess the AZ and detect a hypermetabolic residual tumour. Metabolic imaging surrogates representing residual tumours after ablation have been described and improve the assessment of the AZ. Despite these developments, all imaging techniques carry significant limitations, including those related to reactive hyperaemia or hypermetabolism around the AZ, bleeding, or oedema, especially when used intraoperatively.

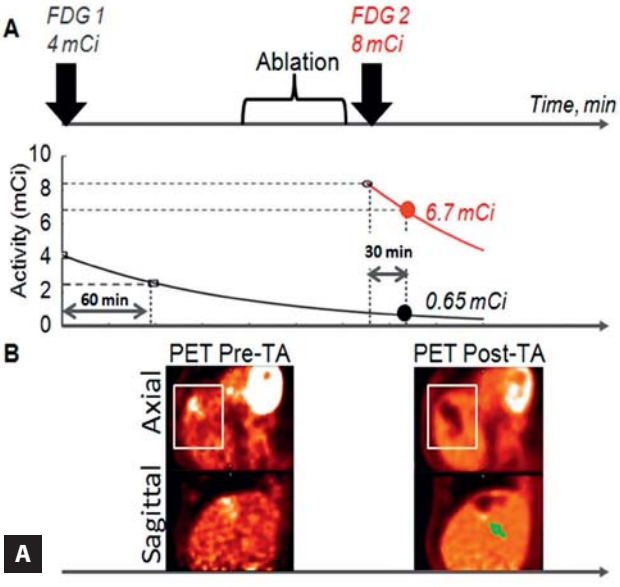
A significant limitation of TA compared to resection is the lack of pathological confirmation of complete tumour eradication with sufficient tumour-negative MM. Trying to achieve the surgical standard of pathologic confirmation of complete resection with wide tumour free margins (R0), prior prospective studies performed examinations of biopsy samples obtained from the centre and margin of the AZ immediately following TA of CLM, showing that MM and biopsy of the AZ are independent predictors of LTP. Optimal assessment of the AZ combines multiplanar AZ and MM computations using fusion of real-time metabolic imaging with CECT of the AZ followed by biopsy of the ablation centre and margin with the aid of 3D models and modified metabolic imaging protocols. The addition of biopsy to the imaging assessments decreases the relative uncertainty of MM measurements.

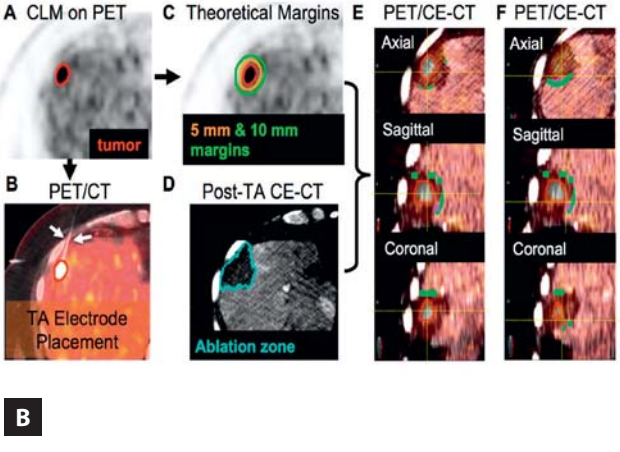
Radiologic-pathologic correlations in resected tumours showed that the radiographic AZ lies within 2 mm of the histopathologic AZ. This critical 1–2 mm difference can be easily miscalculated with current imaging techniques, thus an adequate ablation margin can be measured as suboptimal and vice versa. Further improvements in margin calculation are expected through the upcoming "ACCLAIM" multicentre trial that mandates 3D software confirmation of at least a 5mm MM after TA of CLM (NCT05265169).

Recent prospective studies using immediate post-ablation biopsy of the AZ showed that a post ablation tumour positive result is associated with LTP. The inclusion of AZ assessment through biopsy is particularly helpful when the target tumour cannot be ablated with optimal margins of at least 10 mm. Improved local tumour control was documented for biopsy-proven complete ablation with a MM > 5 mm and are comparable to the outcomes reported for MM >10 mm. This introduces an ablation strategy for tumours that cannot be ablated with wide margins due to their location near critical structures including those at risk for post-ablation biliary complications. The addition of recently described fluorescent methods that can offer rapid assessments of tumour cell viability immediately after TA, allow additional ablation decisions intra-procedurally. To address these issues, intraprocedural 3D biopsy guidance and post-ablation tissue evaluation with real-time morphological and viability surrogates are

implemented in an NIH-supported (R01 CA240569-01) currently enrolling clinical trial (NCT01494324) designed to use all these developments, aspiring to develop disease and ablation-specific, predictive surrogate image biomarkers. Such developments may allow complete non-invasive optimal assessment of the AZ in the future.

A limitation of post-ablation biopsy is that the specimens may not reflect tumour necrosis or viability within the entire AZ, as is the case with resected tumours.





The impact of TA has been demonstrated in randomized control trials (RCT) showing significantly prolonged survival in the combined therapy arm treated with RFA (±resection) in addition to chemotherapy vs. the group treated by chemotherapy alone. Preliminary results of the COLLISION RCT also indicate similar tumour control and patient survival between the resection and ablation groups. These findings support the value of complete tumour eradication by TA when used with local curative intent.

3D volumetric computation of the AZ and MM, leveraging real-time PET findings, intraoperative fusion and rapid histopathological assessment of the AZ are all steps that confirm complete tumour eradication, optimizing TA as a local cure for liver tumours, like the surgical standard.

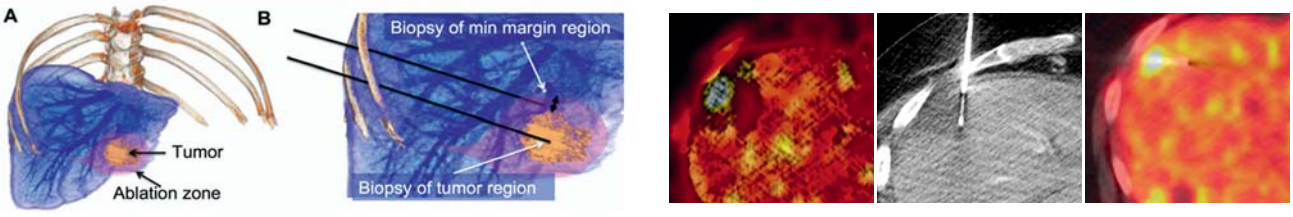
Figure legends

Figure A
Split-dose PET CT guided Ablation

Standard diagnostic FDG activity of 12 mCi administered in 2 aliquots:
–4 mCi within 30–60 minutes before ablation
–8 mCi immediately post-ablation

Figure B
Use of Pre ablation PET CT and post Ablation CECT for multiplanar/3D AZ assessment and margin calculation.

PET image of the tumour (A) fused with CT is used to guide the placement of ablation electrode (white arrows) (B), to segment the tumour and to generate theoretical margins (C). D: Post-TA CE-CT is used to segment the AZ. E and F: Orthogonal views of the fused pre-TA PET and post-TA CE-CT guiding sampling of the tumour region (E) and minimal margin region (F)



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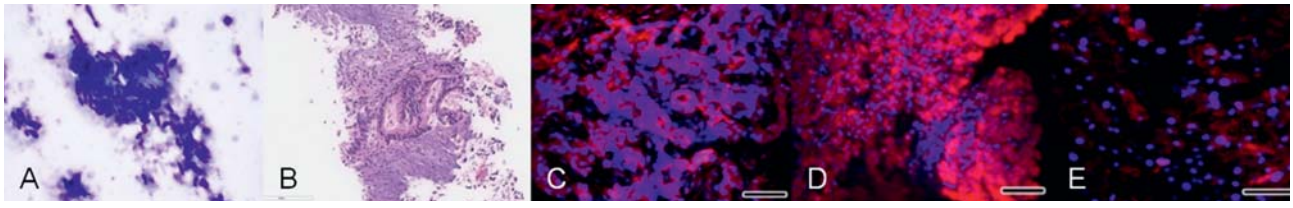

D

Figure legends

Figure C
Post Ablation Biopsy

The bottom three images show how the fusion of PET with CECT facilitates the centre and margin of the AZ.

Figure D
Immediate Tissue Assessments from post Ablation Biopsy of the AZ

A: Imprint Cytology showing Tumour
B: Morphologic Pathologic Stain (H&E) Showing tumour
C-E: Fluorescent morphologic and Viability Composite Stain
C: Viable TumourD: Necrosis/Thermal Artifact
E: Normal Liver.

Constantinos T. Sofocleous
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Prof. Constantinos Sofocleous is a professor of interventional radiology at the Weill-Cornell imedical college in New York City, and an attending physician in interventional oncology at the Memorial Sloan Kettering Cancer Center. He received his medical education at the University of Athens School of Medicine and completed residencies St. Luke's-Roosevelt Hospital Center and the Columbia University College of Physicians and Surgeons, as well as a fellowship at the NYU Medical Center. Prof. Sofocleous is a CIRSE and SIR fellow, the recipient of multiple awards and an author on more than 200 research publications.

He serves in the Executive Council of the SIR as the International Councilor and is one of the Directors at Large of the SIO. He is the Global PI of the recently announced SIO-supported ACCLAIM trial. He serves in the Executive Council of the SIR as the international counsellor and is one of the directors at large of the SIO. He is the Global PI of the recently announced SIO-supported ACCLAIM trial.

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ET 2022 will take place in Nice, France, from June 22-25!

Join us at **ET** 2022!

Embolotherapy has become a mainstay of interventional radiology. CIRSE created ET, the European Conference on Embolotherapy, in order to provide a platform for practitioners, researchers, and the industry to meet, share and connect, further to drive evidence-based and knowledge exchange in the field.

Now, after two years of not being able to meet face-to-face, we are excited to meet in person for ET 2022 to exchange ideas, collaborate, and share the newest developments in the field of embolotherapy. ET 2022 chairpersons Patrick Haage and Otto M. van Delden and the rest of the Scientific Programme Committee have put together a dynamic programme covering everything that embolotherapy has to offer.

Special topic sessions

Highlights of the scientific programme will include sessions on well-established procedures, such as PAE and TARE, as well as newer embolotherapy treatments, such as haemorrhoid artery embolisation and musculoskeletal embolotherapy. Further sessions cover topics ranging from paediatric interventions to haemoptysis to neuroembolisation.

Case remedy sessions

Along with special topic sessions, case remedy sessions are another centrepiece of the ET programme. These sessions will cover real-life cases and discuss tips and tricks for a successful procedural outcome. This year's topics include primary bone tumours, renal cell carcinoma, blunt abdominal trauma, postpartum haemorrhage, vascular and lymphatic malformations, GI bleeding, and many more.

Technical focus sessions

Technical focus sessions will explore new and existing technologies and materials, using ET's focus on technological advances. This year's program will address the most recent developments in coils and plugs, particles, liquids, microcatheters, and microwires, as well as the entire range of technologies needed in embolotherapy.

Scientific paper session

In the growing field of embolotherapy, scientific research is crucial to create a solid evidence-base and support from other specialties. The scientific paper session will showcase seven scientific papers that have been published over the past year.

Sneak peeks

Some faculty members of ET 2022 have generously shared previews of their upcoming lectures – read them in the following pages!

See you in Nice – or online!

The always sunny, seaside city of Nice is the perfect destination for ET 2022. Located along the French Rivera, Nice is one of France's top destinations for both business and leisure.

If you can't make it in person, Nice 2022 will feature an online platform where you can watch all lectures both live and on demand. All Access Pass holders have automatic access to all ET 2022 online content!

The strongly reduced fee for ET 2022 is available until April 28 – register today!

ET 2022 – PROF. FRANCISCO CARNEVALE

Catch his lecture during the PAE session on Friday, June 24 at 08:30 CEST in the main auditorium!

PAE complications – how to avoid and manage them

Prostate artery embolisation (PAE) has emerged as a safe and effective minimally invasive procedure that may improve lower urinary tract symptoms (LUTS), especially in patients with BPH who are contraindicated for surgery. Although the category of adverse events can include both side effects and complications, an understanding of the differences between them is essential.
A "side effect" refers to any expected but untoward response, while a ''complication'' refers to any unanticipated negative outcome related to the treatment.

We have used a modified Clavien classification adapted to the description of adverse events following PAE published in CVIR (2017). Adverse events can happen at all stages of the embolisation procedure and should be classified into intra-operative and post-operative.

Vascular access, catheterisation and embolisation technique, device failure or incompatibility, manufacturing defects, inappropriate use of materials, and drug or contrast reactions are all potential sources of intra-operative complications.

Although good technique may avoid undesired events, vascular access, hematomas, pseudoaneurysms, vascular thrombosis, dissection, distal embolisation and damage of the perivascular, neural and muscular structures may happen even for transfemoral or transradial access.

It is not clear if the use of smaller particles is associated with increased NTE embolisation, but a recent report suggests that the smaller the particle size, the more adverse events, like burning and dysuria, may be observed. Once the prostate arteries have been properly identified and catheterised, embolisation can begin. More distal embolisation, as reported with the PErFecTED technique, appears to achieve the desired greater ischaemic effect, but in some cases has been associated with more side effects, including pain, urethral burning and urinary frequency.

Adverse events following PAE generally include dysuria (9%), urinary infection (7.6%), macroscopic haematuria (5.6%), haematospermia (0.5%), acute urinary retention (2.5%) and rectal bleeding (2.5%).

After embolisation, the urinary flow increases due to the block of the circulating androgens, destruction of the innervation and decrease of smooth muscle tone and urethral resistance. Apoptosis, necrosis or infarction induces cytotoxic oedema, leukocytic infiltration and ischaemic inflammatory prostatitis which can produce a variety of symptoms, including pelvic pain or discomfort, perineal, suprapubic, coccygeal, rectal, urethral, testicular/scrotal pain and obstructive or urinary tract symptoms such as frequency, dysuria, incomplete voiding and ejaculatory pain. In some patients, there may also be nausea, vomiting and fever as well as a temporary worsening of previous symptoms, especially the irritative voiding symptoms due to an increased post-embolic inflammatory process. Collectively, these events comprise post-embolisation syndrome and they should be considered as expected side effects, not complications.

NTE to periprostatic organs and structures can occur due to misinterpretation of the blood supply to the prostate, vascular anatomical variations, highflow vascular anastomoses, suboptimal catheter placement or inappropriate embolic agent reflux. Vasodilators are useful for treating spasms, but they can inadvertently open peri or intraprostatic shunts. Selective angiograms and cone-beam CT facilitate improved safety and efficacy during embolisation, identifying potential sites of NTE and anatomical variations. When larger anastomoses are identified during PAE, embolisation is still possible with slow injection and/or protective occlusion, either temporary or permanent (microcoils), to avoid NTE.

Minor areas of bladder ischaemia following PAE are usually asymptomatic. Cystoscopy and bladder computed tomography (CT) or magnetic resonance imaging (MRI) can help to identify the number and size of ischaemic

areas, perforation to intraperitoneal or extraperitoneal zones or impairment of nearby areas. Small, unperforated lesions can be treated with indwelling catheters and antibiotics. Surgery is indicated for extensive ischaemic areas in the intraperitoneal zone and gross haematuria. Occasionally, ischaemic tissue fragments and clots originating in the bladder or prostate gland may produce pain, AUR or urinary tract infection due to flow obstruction. Cystoscopy may be used to evaluate these instances and clear the bladder.

The arterial supply to the rectum and anus usually comes from the superior, middle and inferior rectal branches, and there is a rich vascular network connecting the inferior mesenteric, internal iliac, internal pudendal and marginal arteries. This explains the low incidence of ischaemic proctitis. Although it is rare following PAE, it may occur due to NTE of the middle or inferior rectal arteries or another variant branch. In the event of NTE of the rectum or anus, patients may complain of low abdominal pain, diarrhoea that may include bloody discharge, proctalgia, erosions, fistula or abscess. Diarrhoea and bleeding may be caused by inflammation or focal ischaemia of the mucous membrane.

Penile ischaemia is a great concern. As dorsal penile arteries are terminal vessels, the inadvertent reflux of embolic agents or misembolisation during PAE may lead to ischaemia. Such a complication may be reported as local pain, erythema, ulcers or sexual dysfunction. Although an erythematous appearance of the glans may suggest ischaemia, it must be differentiated from balanitis or balanoposthitis. Ultrasound Doppler exams and tissue culture may be useful for evaluation. Treatment includes NSAIDs, analgesics, steroids, vasodilators, antiplatelets, low molecular weight heparin, prostaglandin E1 and antibiotics. No irreversible lesions have been reported following PAE. Possible scrotal skin necrosis may happen due to NTE into the testicular branches.

Another potential source of concern is erectile dysfunction, which may happen due to occlusion of the internal pudendal artery. Experimental studies report that after unilateral acute clamping of the internal pudendal, a compensatory contralateral flow is observed with a moderate impairment of intracavernous pressure. Bilateral occlusions resulted in a marked reduction in the intracavernous pressure and low response to neurostimulation. No cases of erectile dysfunction following PAE have been reported so far.

Although usually asymptomatic, the post-ischaemic inflammatory process of the seminal vesicle may result in back, low abdominal or perineal pain, painful ejaculation, haematospermia and irritative or obstructive voiding symptoms. The true incidence of seminal vesicle ischaemia following PAE is unknown.

Clinical seminal vesiculitis may happen due to inflammation observed following PAE. Patients may complain of haematospermia, discomfort and pain in lumbosacral or perineal regions, irritative and obstructive urinary symptoms, decreased semen volume and/or azoospermia. Patients with urethritis or epididymitis are likely to have seminal vesiculitis, suggesting a close relationship between them. Haematospermia usually is self-limiting, generally asymptomatic and resolves spontaneously within a few weeks or after ejaculations. Its correlation with seminal vesical ischaemia remains unclear since the bleeding can have its source in any portion of the genitourinary tract. A transrectal ultrasonography or pelvic MRI may help to diagnose these complications. Treatment usually includes NSAIDs, analgesics and, if necessary, steroids or antibiotics.

Pelvic embolisation rarely results in unintended ischaemia, due to the rich vascular network. Complications such as sciatic neuropathy and pelvic osteonecrosis are rare. The inadvertent embolisation of the obturator artery may result in pubic or obturator ring bone ischaemia. It is usually asymptomatic and only found during CT or MRI. MRI changes become apparent only after 6 h to 2 days.

In conclusion, adverse events can include both side effects and complications, can happen at all stages of the embolisation procedure, and should be classified into intra-operative and post-operative. They can occur due to misinterpretation of the blood supply to the prostate, vascular anatomical variations, high-flow vascular anastomoses, suboptimal catheter placement or inappropriate embolic agents as well as to reflux to small vessels should always be avoided. Although most complications are described as minor, their recognition, understanding and standardized description are fundamental to minimise risks, adequately manage and maximize the value of PAE. In general, even with a potential for several adverse events, it's necessary to state that PAE is a very safe procedure with much lower complications rates compared to other surgical options of treatment.

Francisco Cesar Carnevale
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Prof. Francisco Carnevale is Chief of Vascular Interventional Radiology at the University of Sao Paulo Medical School. He is also the former president of the Brazilian Society of Interventional Radiology and Endovascular Surgery (SoBRICE). In 2014 he gave the Josef Rosh Lecture presentation at CIRSE 2014 in Glasgow, Scotland.

Prof. Carnevale has published over 100 peer-reviewed publications, and in 2008 Carnevale et al. performed the first intentional treatment of LUTS due to benign prostatic hyperplasia using PAE as a successful minimally invasive endovascular modality of treatment.

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ET 2022 – PROF. MARK LITTLE

Catch his lecture during the special topic session on joints, Thursday, June 23 at 10:00 CEST in the main auditorium.

Musculoskeletal embolotherapy: trends and developments

Musculoskeletal (MSK) conditions such as osteoarthritis, tendinopathy, and enthesopathy affect 1 in 4 adults, resulting in pain, loss of function and reduced quality of life. The secondary co-morbidities associated with these conditions include diabetes, obesity, and depression. With 1/3rd of all work absences attributable to MSK conditions, the direct and indirect costs are huge, estimated to be 5.76% of the national gross domestic product (GDP) in the USA(1). Therapy for these conditions traditionally starts conservatively in the form of analgesia, physiotherapy, weight-loss programmes, steroid injections, and orthotics. For patients with severe disease, and or who are resistant to conservative treatments, surgery may be an option. Unfortunately, many patients fail conservative therapies, and are not suitable surgical candidates. Over the last decade, MSK embolotherapy has emerged as a safe, and potentially efficacious treatment option for these patients.

The scientific rationale for MSK embolotherapy comes from in-vivo studies elucidating the role of neo-angiogenesis in creating a nociceptive response(2). In osteoarthritis, VEGF expression is found to be increased in chondrocytes(3). Vascular growth disrupts the osteochondral junction, with inflammation propagating synovial angiogenesis through macrophage activation. Angiogenesis is therefore hypothesised to cause the structural damage and pain in OA, and can be exploited as an embolisation target(2). The first published description of MSK embolotherapy in humans was in 2013 by Okuno et al(4). Seven patients were embolised using imipenem/cilastatin sodium (an antibiotic with temporary embolic properties) to successfully treat patellar tendinopathy, rotator cuff tendinopathy, plantar fasciitis, lateral epicondylitis, iliotibial band syndrome, and Achilles insertion tendinopathy. Since this initial paper, there has been a steady increase in studies investigating the role of embolotherapy in a raft of MSK conditions.

The largest evidence-base for MSK embolotherapy is currently for the treatment of knee osteoarthritis. All studies to date have revealed consistent findings; genicular artery embolisation (GAE) is a safe and technically achievable technique resulting in a reduction in pain at early follow-up(5–12). As with any intervention designed to treat pain, the placebo effect must be considered; the recent randomised sham-controlled trial from Bagla et al addressed the placebo effect for the first time, showing GAE to be superior to a sham procedure in a small cohort of patients(5). More work is required to confirm generalisability of the data, and establish optimum technique and patient selection. The National Institute for health and Care Excellence (NICE) recently published recommendations on GAE preferring future research to be randomised controlled trials against sham or current best practice; highlighting the need to report details of patient selection and identify those who would most benefit from the procedure(13). Current data suggests the ideal patient for GAE is someone with mild to moderate OA, resistant to conservative treatments, with lack of severe meniscal injury, or bone marrow oedema on pre-procedural MRI(14).

A sound knowledge of anatomy, embolisation end-point and equipment is required in order to perform safe and effective MSK embolotherapy (figure 1). As with all embolisation procedures, the smaller the particle size, the greater the risk of non-target embolisation. Bagla et el reporting two cases of temporary plantar paraesthesia following GAE, thought to be due to inadvertent embolisation of a branch of the tibial nerve using 75micron permanent particles(6). There are many important anastomoses between the arteries navigated during MSK embolotherapy, that can aid embolisation coverage, but also increase risk of non-target embolisation(15). Embolic choice is an important consideration, with enthesopathy mostly treated with imipenem/cilastatin sodium due to its transient effect, and risk of end organ damage. The number of diseases being treated with the technique is expanding rapidly, with recent success in treating refractory trapeziometacarpal osteoarthritis(16), and a small retrospective case series describing the use of imipenem/cilastatin sodium in patients with chronic lower back pain resistant to conservative treatments(17). Adhesive capsulitis (AC) is another disease with a growing evidence-base. Utilising radial artery access, embolisation of the hyperaemia seen

in AC can be performed as a day-case procedure, making it an appealing treatment option. In one recent study, complete recovery was achieved in 37/40 (92.5%) patients following embolisation for AC(18).

MSK embolotherapy is the next frontier in interventional radiology, with the potential to help millions of patients. We must concentrate on producing high-quality research evidence to confirm the findings of early data, refine technique, and optimise patient selection.

Disclosures:
Professor Little is a paid consultant for Boston Scientific, Crannmed, Merit Medical, and Guerbet

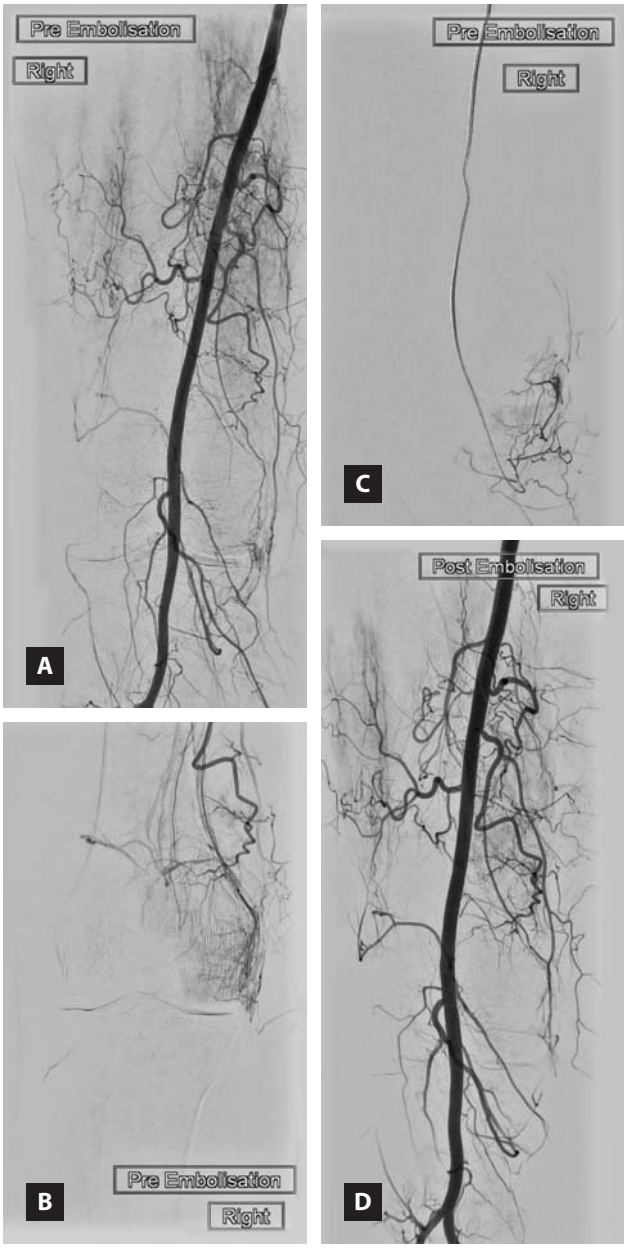

Figure legends

52-year-old female with right knee medial compartment osteoarthritis (Kellegren Lawrence grade 3).

A: Diagnostic angiogram from the distal SFA revealing an area of hyperaemia within the medial tibiofemoral compartment synovium (solid arrow). A microcatheter was navigated into the medial articular branch of the descending genicular artery (B), and the Inferior medial genicular artery (C). The hyperaemic process embolised using 100-300micron Embosphere particles with good angiographic result (D). The patient had a significant clinical improvement at 12-month follow up.

Mark Little
Royal Berkshire NHS Foundation Trust, Reading/UK

Professor Mark Little is a consultant interventional radiologist and research lead at the University Department of Radiology, Royal Berkshire NHS Foundation Trust, UK. Prof. Little has established a large embolotherapy research group alongside his busy clinical practice, and was awarded the NIHR research rising star award 2018. Prof Little is currently leading the first European study investigating Genicular Artery Embolisation (GAE) in the treatment of knee OA (GENESIS).

He is UK CI for PROstate, an international study investigating long term outcomes of PAE. In 2021, his group opened a trial investigating the neuro-psychological factors correlating with failure to adhere to a day-case UAE pathway. He is current specialist advisor on the NICE interventional procedures programme, and is a member of the CVIR editorial board

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ET 2022 – PROF. VINCENT VIDAL AND DR. FAROUK TRADI

Catch Prof. Vidal's lecture during the haemorrhoids special topic session on Saturday, June 25 at 08:30 CEST in the main auditorium!

Haemorrhoid artery embolisation: outcome and results

The emborrhoid technique has emerged as a new treatment option for patients with chronic hemorrhoidal disease. Although pathophysiology remains contentious, internal hemorrhoidal pathology is thought to be the result of chronic hypertrophy of these vascular structures.

Emborrhoid technique

The emborrhoid technique was developed 8 years ago as a minimally invasive radiologic alternative to elective trans-anal Doppler-guided haemorrhoid artery ligation (DG-HAL) [1]. It consists of endovascular occlusion of the haemorrhoid branches of the rectal arteries [2].

The emborrhoid technique does not need peri-procedural medication and is carried out as an outpatient intervention. The femoral artery is punctured using the Seldinger technique under local anaesthesia. A radial approach is also completely feasible. A 4-F catheter is placed at the origin of the IMA for selective angiography. Haemorrhoid arteries are easily identified, appearing tortuous and vertical at the level of the pubic bone. A microcatheter is advanced as far as possible into the SRA branches up to the CCR. Varying embolic agents can be used. Based on clinical practice, metallic fibered coils are usually used and allow an effective occlusion of the target vessels with no risk of bowel ischaemia related to a distal but nonterminal embolisation. Internal iliac arteries (IIA) can be involved in haemorrhoid vascularisation in almost a quarter of the cases. The middle rectal arteries (MRA) can be embolised in the same manner, in the same session. (Figure 1) Technical success rates in the literature have been very high, ranging from 93% to 100% [3-8].

Clinical results

To date, the results from almost 250 patients embolised using the emborrhoid technique have been published in several studies [9-11]. The reported clinical success of the emborrhoid technique is between 63% and 94%, with no major complications [3-8]. Recurrence of bleeding is the main reason for clinical failure, which can be treated by redo procedures as needed. Treatment failure may be due to the presence of significant MRAs4. The highest rate of efficacy has been reported with microspheres associated with microcoils [7]. This embolic agent can provide a more distal occlusion of the target vessels. Recently, a study of the use of microspheres has confirmed these results, with a clinical success rate of 93% [12]. Not surprisingly, the rate of minor complications was high, close to 50%, and consisted of small ischemic ulcerations of the anorectal junction, probably related to non-target embolisation. Large size spheres (>700µ) with a selective and non-wedged infusion are probably safe, according to literature, and could probably reduce the recurrence rate [9-11]. Embolisation with liquid agents is discouraged. A recent animal model study demonstrated a rate of rectal necrosis in 100% of cases after distal embolisation with liquid agent [13].

Challenges

Current data support the feasibility, efficacy, and safety of SRA embolisation for haemorrhoids. However, since the first publication about the emborrhoid technique eight years ago, several outstanding questions remain. First, better patient selection is necessary. Patient populations in both previous studies and real-life practice have been heterogeneous. Bleeding scores can aid in better patient selection, reducing the subjective part of the evaluation of symptom severity. A new validated bleeding score has been published recently [14]. Such a score will likely provide a more accurate and reproducible method of assessment before and after treatment and thus will improve embolisation results. Finally, randomised controlled trials with longer follow-up are mandatory to determine the optimal role of this emerging and minimally invasive technique.

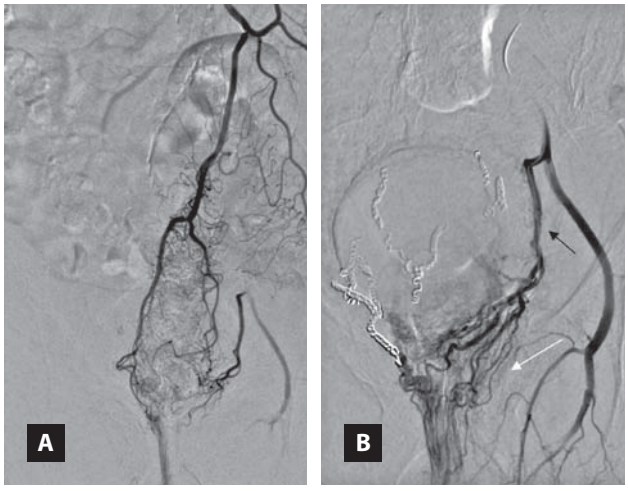

Figure legends

Frontal angiograms of the SRA (A) end the left MRA (B) showing a variant anatomy with a prominent left MRA arising from the internal pudendal artery (black arrow). After the embolisation of SRA, catheterisation of the MRA shows a complete revascularisation of the corpus cavernosum recti (B, white arrow).
This artery was embolised with micro-coils.

Vincent Vidal
Aix-Marseille University, Marseille/FR

Prof. Vincent Vidal is a professor at the Faculty of Medicine and Director of the Experimental Interventional Imaging Laboratory at the Aix-Marseille University (France).
He received his M.D and Ph-D from the School of Medicine of Aix-Marseille University and completed his research fellowships at the Toronto University (Canada) and at the University of Montreal (Canada) in 2003-2004.

Prof. Vidal is an active member of multiple interventional radiology societies (SIR, CIRSE, ESR, APSCVIR) and his clinical work and research focuses on embolisation. He is the chairperson of the ET 2022 local host committee.

Farouk Tradi
Assistance Publique – Hopitaux De Marseille, Marseille/FR

Dr. Tradi complteted his undergrad medical education Aix-Marseille University in Marseille, France. After an IR fellowship at Montreal University, he came back to Marseille to complete his doctorate focusing on interventional radiology.

He is currently the Chairman of the French Junior IR Committee, named JuRI, a young association created in order to promote education on IR.

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ET 2022 – DR. IRENE BARGELLINI

Catch her lecture during the special topic session on TARE, Thursday, June 23 at 14:30 CEST in Auditorium 2

TARE: procedural and technical aspects

Trans-arterial radioembolisation (TARE) has gained worldwide acceptance as a safe and effective treatment for primary and metastatic unresectable liver cancer [1-3]. Through selective administration of microspheres loaded with beta-emitting isotopes, the goal is to deliver a tumoricidal absorbed dose to liver tumours while sparing healthy liver tissue and limiting systemic toxicity [4].

However, the success of the procedure is strictly related to multiple clinical and technical factors:

- **Patient selection,** including liver function, performance status, tumour burden and previous medical history, such as previous transarterial therapies [5-6];
- **Dosimetry,** to be personalized based on tumour histology, treatment goal and type of microspheres [6-10];
- Precise and complete **tumour targeting** [7];
- **Microspheres' distribution** which may vary according to several parameters, such as tumour extension and vascularisation, position and orientation of the microcatheter, injection velocity, number of administered spheres [11-13].

Thus, the preliminary diagnostic work-up becomes essential for planning the best strategy to enhance complete and homogeneous tumour targeting while limiting non-target embolisation.

The diagnostic work-up can be summarized in few essential steps:

1) Identification of all tumour arterial feeders, with evaluation of their haemodynamics

In the case of multiple feeders from different branches, it is important to assess if all feeders are able to receive a proper quantity of spheres based on their vascularisation territory. Frequently, there may be major and minor tumour feeders, and the latter may require coil embolisation at a proximal level to enable flow redistribution, reducing the number of injection points (Figure 1) [14,15].

Flow redistribution requires an in-depth knowledge of the possible intra- and extra-hepatic arterial connections, and it should be performed only when strictly needed, since it may be tricky and unpredictable, varying upon vascular anatomy, tumour type and location [16]. The success of flow redistribution has been reported to be lower when parasitized arteries are embolised proximally [17], as well as in centrally located tumours when unilobar treatment is planned [18]. Moreover, lower success rates have been reported in hypervascular bulky lesions, such as neuroendocrine metastases, which can result in unpredictable collaterals [17].

2) Identification of any extrahepatic vessel originating from the target area

Non-target embolisation may expose the patient to severe complications due to irradiation of nearby organs, such as the stomach, jejunum, gallbladder, and so on. The diagnostic work-up always requires at least the identification of the origin of the left and right gastric arteries and the cystic artery. When needed, these arteries require embolisation to avoid possible complications.

Whether the **cystic artery** can be overlooked is still a matter of debate. Our local policy is to avoid including the cystic artery in the treatment territory, placing the microcatheter distal to its origin, and even splitting doses into different injection points, if needed (Figure 2). This is particularly true when dealing with relatively hypovascular lesions, such as metastases, in which we are not able to rely on the preferential flow into the tumour feeding vessels. Permanent embolisation of the cystic artery is usually avoided, since ischaemic cholecystitis may occur.

To identify possible non-target embolisation areas, the use of **cone-beam CT** is highly recommended. Also, when identifying suspicious arteries during diagnostic angiography, even if the entire branch is not fully recognized, its selective catheterisation should be performed to rule out possible connections with non-target areas (Figure 3).

3) Optimisation of catheter position and tip orientation

Previous studies have clearly demonstrated how spheres' distribution is strongly influenced by the catheter's position and orientation [11-13]. For instance, when positioning the catheter close to an arterial bifurcation, a preferential flow into one of the two branches is frequently observed, which may be determined by the distal vessels' size and their area of distribution as well as by the morphology and the orientation of the catheter's tip. The tip's orientation is influenced by the anatomy of the more proximal vessels, and the type and position of the supporting 5 Fr catheter. The challenge for the operator is to select the most proper position of the catheters to obtain a homogeneous flow distribution in the entire target volume. To do so, changes in position of the supporting catheter as well as of the microcatheter should be attempted until the optimal flow distribution is obtained.

4) Reproduction of the injection velocity

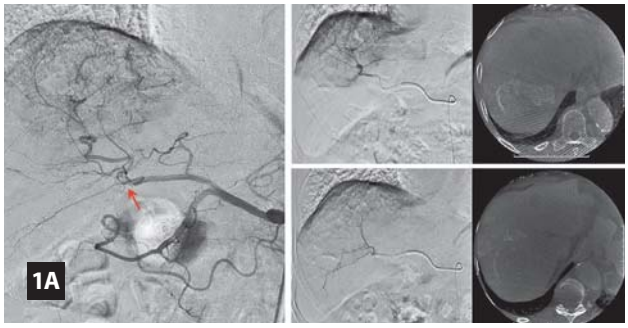
During the preliminary work-up, operators need to be aware of the striking differences in injection velocity when using power injections compared to manual injections. Considering that the treatment will be performed by **slow manual injections,** the final evaluation of flow distribution and the administration of the Technetium-99m-labelled Albumin MacroAggregates should always be performed by manual injections, trying to reproduce the injection velocity that will be used during the treatment dose administration.

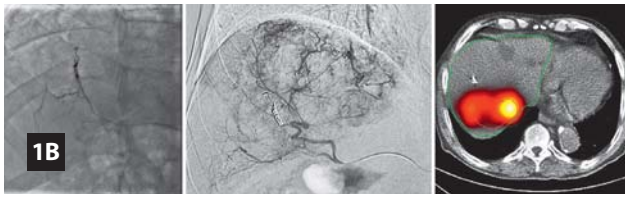
Irene Bargellini
University Hospital of Pisa, Pisa/IT

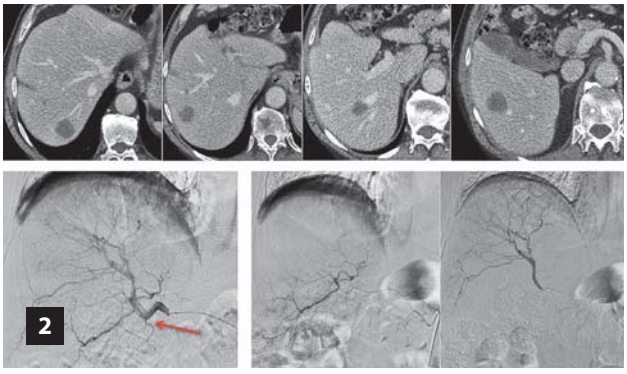
Dr. Irene Bargellini is interventional radiologist at the University Hospital of Pisa in Pisa, Italy.
She received her medical degree from the University of Pisa in 1999, completed her radiology residency in Pisa in 2003 and received a master's degree in Interventional Radiology in 2017.
The main focus of her clinical and scientific work is on oncologic imaging and interventional oncology, with particular reference to liver imaging and liver tumors' loco-regional and systemic therapies.
Dr. Bargellini is active member of the Italian Society of Radiology (SIRM), European Society of Radiology (ESR), European Society of Gastrointestinal and Abdominal Radiology (ESGAR), Cardiovascular and Interventional Radiology Society in Europe (CIRSE) and the International Liver Cancer Association (ILCA).

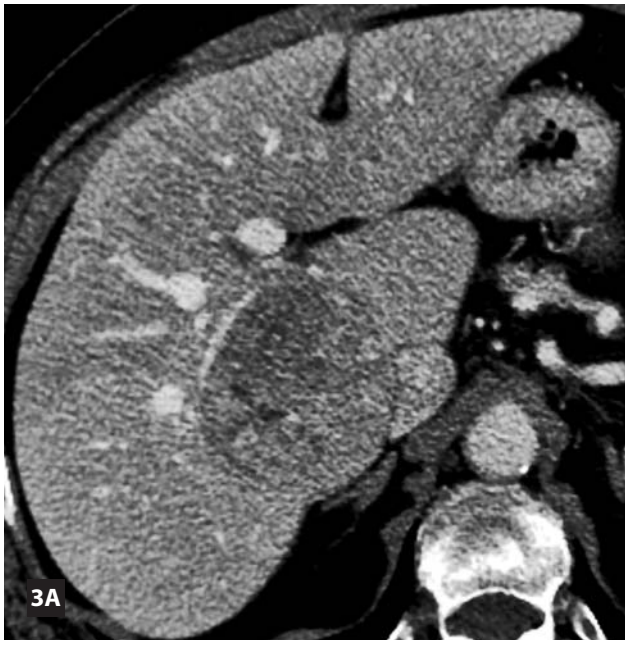
She serves as reviewer of several national and international journals; she has been vice-director of Giornale Italiano di Radiologia Medica and member of the Editorial Board of European Radiology and Cardiovascular and Interventional Radiology.
She has authored and co-authored more than 90 articles in peer-review journals, is co-author of several book chapters, and has given over 260 invited lectures at national and international meetings.

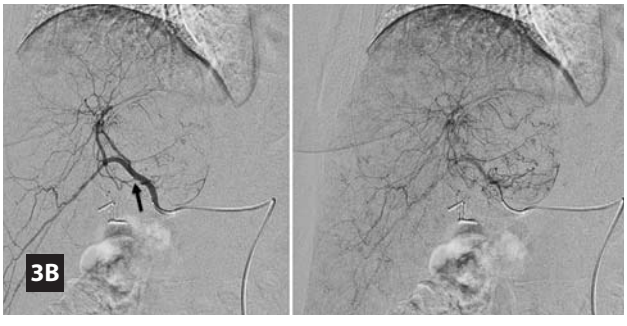
Figure legends

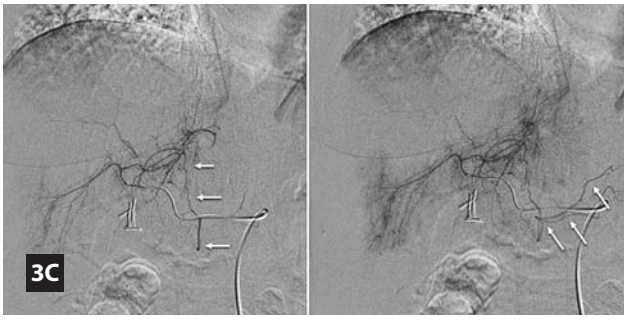


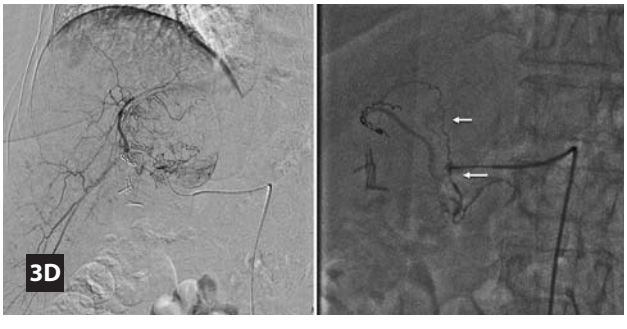












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ET 2022 – DR. DEBORAH LOW

Catch her lecture during the special topic session on trauma and emergency, Thursday, June 23 at 8:30 CEST in the main auditorium.

Trauma and emergency: acute thoracic bleeding

Thoracic injury is common in polytrauma patients and can be life-threatening, especially if not promptly identified and treated during the primary survey. Injury to the thorax directly accounts for approximately 25% of trauma related mortality and contributes (usually due to lung injury) to another 25%. Blunt injury to the chest is often associated with abdominal, pelvic and head injury and is more common than penetrating trauma.

IR may get involved slightly later in management compared to other aspects of trauma, as lifesaving interventions such as airway management and chest tube insertion for pneumo/haemothorax are vital early interventions.

In a major trauma centre, causes of acute thoracic bleeding, in which IRs are often involved, are aortic transection and vascular injury related to stab (penetrating) wounds or rib fractures. The former is usually managed with stent grafting and therefore not for an embolotherapy conference!

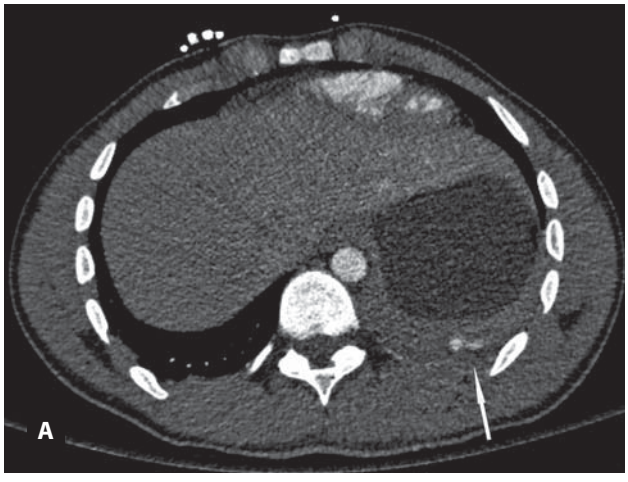
Massive haemothorax is defined as greater than 1500mls of blood in an adult. In blunt trauma, it is most commonly due to multiple rib fractures with associated lacerated intercostal arteries. However, bleeding can also be due to lung parenchymal lacerations and hilar vascular injuries.

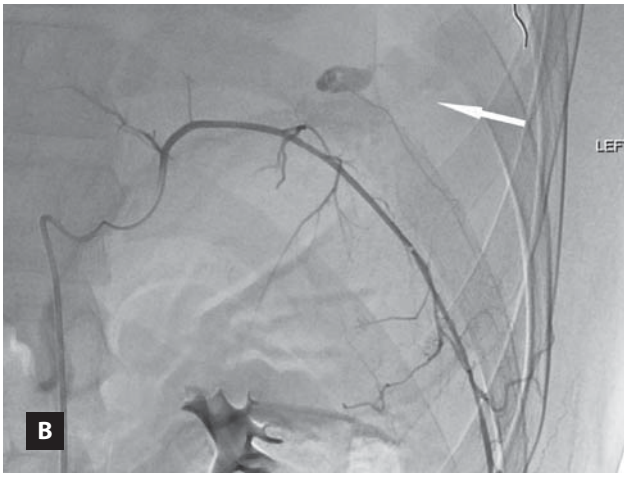
It is the 'massive' haemothorax that is an indicator for 'operative'/surgical intervention, although if intercostal artery injury is identified, IR and transarterial embolisation (TAE) should be considered primarily or in addition to this. Indeed, significant haemothorax from intercostal artery injury can be a delayed presentation.

Therefore, the most common injury requiring embolisation is haemothorax due to intercostal vessel injury, owing to their location in the neurovascular bundle beneath the inferior rib edge. However, they also arise as branches from the subclavian artery. There is also the internal mammary artery – all may be in the trajectory of injury and result in significant blood loss. Therefore, knowledge of the anatomy of the chest wall vasculature and associated pathways is important.

In my experience, all patients who undergo IR for thoracic trauma will have been imaged with CT. There is then the challenge of identifying the level or levels of injury in relation to the site of contrast extravasation on CT. This is often not obvious or easy, and an open mind and thorough interrogation of possible sources needs to be the approach.

In addition to trauma, there is also iatrogenic injury from the 'innocent chest drain insertion' that has gone awry!





We will discuss:

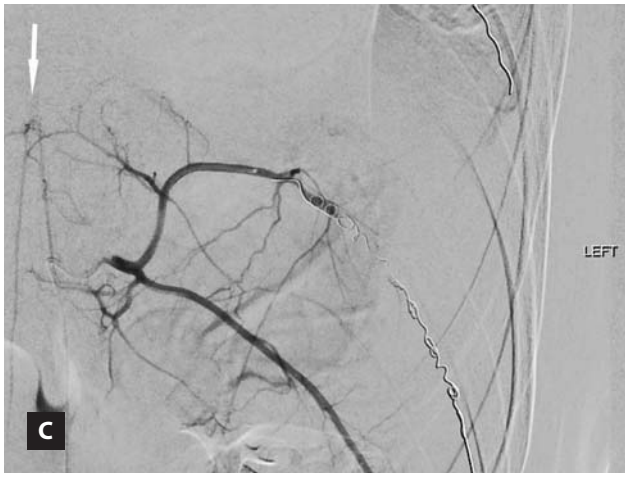
WHEN to intervene – thoracic haemorrhage may not seem significant on initial CT. Concern is raised with a change in haemodynamics or volume of blood loss from a chest drain. A haemothorax does not necessarily mean intercostal/arterial injury, and often draining the haemothorax, re-expansion of the lung and resuscitation will result in cessation of bleeding. 80% of pneumothorax/haemothorax injuries can be definitively managed with thoracostomy. Identifying the cause of the haemothorax, if possible, and communicating with the trauma team is paramount in the management of these patients – situations can change quickly.

HOW – access to the small intercostal vessels and anatomical considerations. Be prepared to change from your usual 'go to catheter'; the importance of selective distal angiography of MULTIPLE vessels – don't fall for the 'satisfaction of search' once a bleeding point is found. There is often more than one contributor!

WHAT – embolic agents for this purpose – most have been used, where you need to place them, how much to embolise, important anatomy (collaterals, the spinal artery – Artery of Adamkiewicz) and thus awareness of potential consequences.

WHEN – to consider an operative/surgical approach. There are ATLS guidelines and indications for urgent thoracotomy in the context of trauma and in my experience, they are acted upon swiftly without requiring IR involvement. However, when we can help, communication with the trauma team or thoracic team is key in the management of these patients, as the nature of an additional injury to the thorax and/or other injuries will dictate the nature and timing of IR and/or surgical intervention.

It may be obvious from imaging (Fig. 4) that a surgical approach is required!



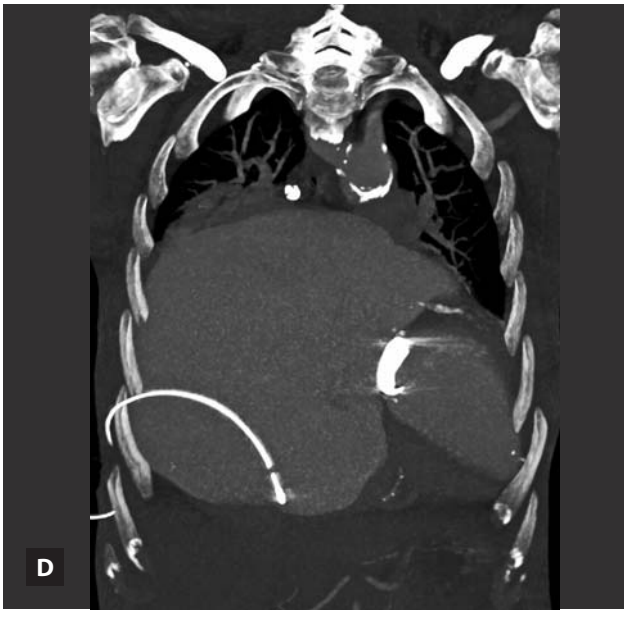


Figure legends

Figure A
Evidence of active extravasation (arrow) on a second CT into a relatively small but persistently bleeding haemothorax.

Figure B
Selective arteriography of intercostal vessels demonstrates delayed blush of contrast (arrow) – with several supplying vessels.

Figure C
Embolisation across the supply. Final arteriography also demonstrates the anterior spinal artery at this level (arrow) – something to beware of.

Figure D
Chest drain inserted into huge left atrium rather than suspected haemothorax – requires surgical repair!

Deborah Low
Barts Health NHS Trust, London/UK

Dr. Deborah Low is a Consultant Interventional Radiologist at the Royal London Hospital and St. Barts Hospital, London, and has been so for 15 years. Prior to this, she trained in interventional radiology and clinical radiology in Toronto, Canada and Nottingham, UK.

The Royal London Hospital is one of London's major trauma centres, in addition to being a tertiary referral centre for many specialties.

Dr. Low is also the Training Programme Director for Barts Health Clinical Radiology training programme encouraging radiology trainees to become the future generation of interventional radiologists!

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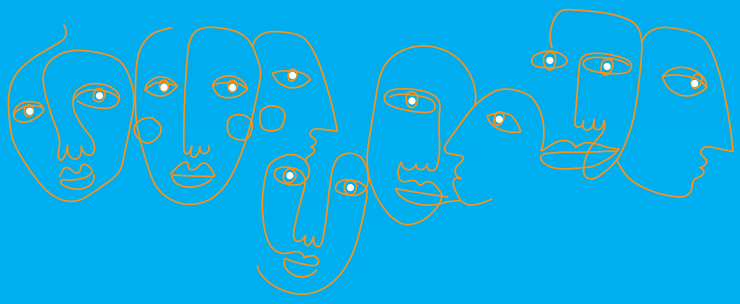
CIRSE is headed back to an in-person congress, and back to Barcelona!



CIRSE 2022 – Science for people

After a challenging two years, during which the CIRSE annual congress was successfully converted into an online meeting, the CIRSE 2020 and 2021 Summits, preparations are well underway for the long-awaited return of an in-person meeting. CIRSE 2022 will place in Barcelona, Spain, from September 10-14.

Under the direction of Thomas Kröncke and Adam Hatzidakis, the Scientific Programme Committee has constructed an exciting four-and-a-half day educational programme with two main foci: building the evidence through research and enhancing patient-centred care. A science for people!

Scientific highlights

CIRSE 2022 will cover the full range of interventional radiology topics, from well-established therapies to the to the most recent data releases and latest hot topics. The programme features several different session types, from case-based discussions and video learning sessions, to round-table discussions, to focus sessions centring in on the ins-and-outs of daily clinical practice.

The first day of the congress will include the fourth PAD Day, featuring the FIRST@CIRSE session providing a platform for the presentation of the latest research and data in peripheral arterial disease.

IDEAS, the Interdisciplinary Endovascular Aortic Symposium, will take place from Sept. 11-13. This congress-within-a-congress on aortic treatment will place emphasis on interdisciplinary knowledge exchange with faculty comprised of interventional radiologists and vascular surgeons from around the world.

This year's CIRSE programme will also include dedicated tracks on oncology, embolisation, venous, arterial, neuro and non-vascular interventions, as well as IR management.

You can browse the full programme here!

See you in Barcelona… and online!

2022 will be the sixth time that CIRSE takes place in Barcelona, Spain. Situated on the picturesque east coast, this Catalonian city is one of the most vibrant and international cities in Europe, providing an exciting backdrop for our meeting. The conveniently located, airy Centre de Conventions International de Barcelona (CCIB) will be our stage for meeting, discussing and learning.

For those who cannot travel in person to the congress, CIRSE 2022 will also feature an online platform where you can view all lectures taking place in Barcelona both via live stream and on-demand after the sessions have concluded. Access to the CIRSE 2022 online platform is available exclusively through the Digital All-Access Pass.

After a pause due to the pandemic, ESIR kicked off 2022 in Strasbourg, France.

The ESIR is back!

The European School of Interventional Radiology provides premier and therapy-focused educational programmes for IR professionals, helping participants stay on the cutting edge of interventional medicine. With 104 courses held in 23 countries today, the ESIR has been offering continuing IR education since 2006.

After the pandemic prevented in-person meetings for nearly two years, this February finally saw a return to collaborative, face-to-face education with the ESIR course "Ablation from A to Z" at the Institute of Image-Guided Surgery in Strasbourg, France from February 24-25.

Organised by Prof. Afshin Gangi and his team, this course was designed for interventional radiologists wanting to fine-tune their practical skills and learn more about current treatment options using ablation techniques and advanced image-guidance. Spread over two days, it offered a comprehensive overview and in-depth learning experience on ablation techniques, measures and monitoring.

ESIR travelled to Harlow, UK, in late March for a course entitled "Multidisciplinary Endovenous Management of Varicose Veins, Varicocele, & Pelvic Congestion". Organised by Dr. Zaid Aldin and the endovascular team at the Princess Alexandra Hospital, attendees learned fundamentals and techniques on this topic through lectures from expert faculty members and hands-on experience opportunities.

The next ESIR course will take place in Munich, Germany, from May 13-14!

UPCOMING COURSES

The next ESIR course will take place in Munich, Germany, from May 13-14 and will focus on TACE in primary and secondary liver cancer. Participants will hear theoretical presentations and be able to get hands-on experience with the most current devices and technologies.
The Strasbourg and Harlow courses were both fully booked – don't wait to secure your spot in Munich!

Click on the images below to learn more about all of the ESIR courses on offer for the rest of 2022!

TACE in Primary and Secondary Liver Cancer
Munich (DE) | May 13-14, 2022
Local host: T.F. Jakobs
Barmherzige Brueder Munich Hospital

Hands-On Liquid Embolisation
Strasbourg (FR) | November 17-18, 2022
Local host: C. Binkert
IHU – Institute of Image-Guided Surgery Strasbourg

Radioembolisation of Liver Tumours
Utrecht (NL) | November 3-4, 2022
Local Host: M. Smits
University Medical Center Utrecht

Reliability in Percutaneous Tumour Ablation
Innsbruck (AT) | December 15-16, 2022
Local Host: R. Bale
LKH – Universitätskliniken Innsbruck

Register now! Jetzt anmelden! Regístrese ahora!

EBIR – Increasing accessibility by removing language barriers

With application numbers being at an all-time high, the EBIR continuously strives to become more accessible to interventional radiologists across the globe. Increased access to the EBIR examination was not only accomplished through the full digitisation of the examination, which makes travel to an examination venue no longer necessary, but also through the new offer of additional language options.

"Offering the EBIR in different languages takes away the barrier to some potential candidates who, although are excellent IRs, would find sitting the examination in English challenging and are put off applying for this important examination."

Raman Uberoi
EBIR Examination Council Chairperson

Increased demand for the German language examination

In January 2021, 33 participants took advantage of the first new format German language version of the EBIR, which was the result of a CIRSE collaboration with the German and Austrian national IR societies - the Deutsche Gesellschaft für Interventionelle Radiologie (DeGIR) and the Österreichische Gesellschaft für Interventionelle Radiologie (ÖGIR). In addition to being offered to all German-speaking IRs, the German language examination now complements the countries' certification pathways and is offered on an annual basis. The second sitting of the German language edition took place in March 2022, with even more registered candidates.

CIRSE collaborates with SERVEI to deliver first Spanish-language examination

CIRSE's latest collaboration has also been in high demand. Following the success of the German language option and in response to the increase in Spanish-speaking exam takers over the past three years, the EBIR Committee is proud to announce that, in collaboration with SERVEI, the first Spanish-language EBIR will take place in October 2022. With the absence of a recognised exit examination in IR, the EBIR has become the most prestigious recognition that Spanish IRs can access. Thanks to its user-friendly, fully remote format, Spanish-speaking IRs not just from Europe but from all over the world are now able to certify their knowledge and expertise in the comfort of their homes and in their native language.

"SERVEI is pleased to collaborate with CIRSE in the development of the Spanish version of this important qualification. Making the EBIR more accessible in the Spanish-speaking world will be a great benefit for Hispanic IRs and will contribute to increasing their visibility and recognition."

Mariano Magallanes
President, SERVEI

The examination is based on the European Curriculum for Interventional Radiology and covers all fields of vascular and non-vascular interventions as well as interventional oncology. A Spanish version of the curriculum is available for download here.

To offer the best exam preparation possible, sample questions in Spanish will be made available on the CIRSE website soon.

To learn more about the remote, online-proctored EBIR examination format and eligibility criteria, visit the CIRSE website at **www.cirse.org/ebir**.

The next EBIR exam will take place in English and Spanish in October 2022!

Upcoming examinations:

Examination dates 2022
- October 20 | English | Spanish
  application deadline September 15, 2022

Examination dates 2023
- March 23 | English | German
  application deadline February 16, 2023
- October 19 | English
  application deadline September 14, 2023

Plenty of online learning resources are also available at the CIRSE Academy or the CIRSE Library to help you prepare for the examination. To find out more, go to **academy.cirse.org**.

Stepping it up – the European Certification for Endovascular Specialists

While the EBIR examination tests the knowledge a radiologist has acquired through dedicated specialty training to safely and competently practice interventional radiology, there is a new option to certify more specialised IR training and experience.

IRs who have been specialising in endovascular therapy and can demonstrate their experience and professional development in this area are eligible to apply for the European Certification for Endovascular Specialists, the EBIR-ES. Basic eligibility criteria are having held the EBIR for at least four years, completing designated online training courses and being able to prove a certain number of advanced endovascular therapeutic procedures.

For a comprehensive list of criteria and more information, please visit the CIRSE website at **www.cirse.org/ebir**.

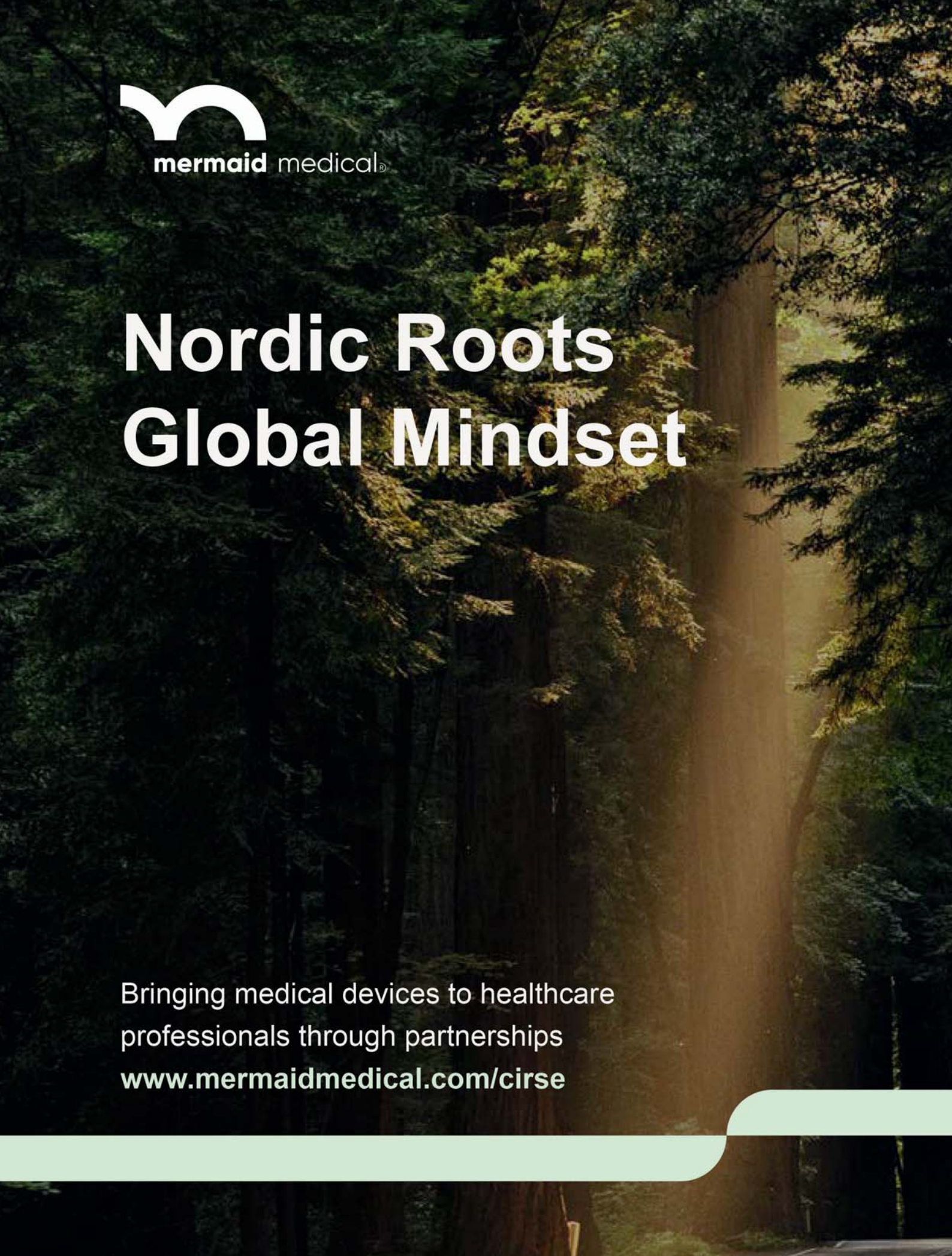
Endovascular specialists are welcoming this opportunity to make their training and expertise visible to their patients and colleagues. Prof. Warren Clements, EBIR-ES, from Australia states:

"I think it is vital and reassuring for our patients to know that we are trained and credentialed in advanced IR. The title that comes with the qualification expresses knowledge and dedication to continuous training."

Warren Clements

He also mentioned the importance of the clinical aspect of IR practice the qualification covers. The EBIR-ES also fosters the recognition of endovascular specialists administering their expert treatment as full clinicians, be it in outpatient clinics or ward rounds.

Find out about how you can apply!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