Fifth European Conference on Interventional Oncology

The Review

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The ECIO 2014 Review

Impressum

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A Gateway to Interventional Oncology: ECIO visits Berlin

The iconic city of Berlin has long been known as a hub of dynamism. Throughout the last century, the city has been a hotbed of experimental politics, music and art, and has been home to famous medical innovators such as Rudolf Virchow, Robert Koch and Ferdinand Sauerbruch. It is thus fitting that Berlin played host to a meeting dedicated to the rapidly growing field of interventional oncology – ECIO 2014.

This year's meeting was attended by over 1,000 participants from more than 50 countries, who availed themselves of almost 50 hours of education.

Educational formats

This year saw the introduction of Video Learning Sessions. Two sessions were held; one on transcatheter therapy and one on percutaneous techniques, with both proving highly popular.

Interactive learning was also enabled by six different Hands-on Workshops. Four of these were dedicated to image-guided tumour ablation in different tumour types (bone, lung, liver and kidney), while two on radioembolisation were added to the programme for the first time.

As ever, a multitude of clinical focus sessions, technical focus sessions, tumour boards and e-voting sessions were also offered.

Multidisciplinary programme

A number of Joint Sesssions were also held, with representatives from several renowned oncology groups, including the International Liver Cancer Association (ILCA), the European SocieTy for Radiotherapy and Oncology (ESTRO), the World Conference on Interventional Oncology (WCIO) and for the first time, the European Organisation for Research and Treatment of Cancer (EORTC).

Several of these speakers also took part in Clinical Focus Sessions and various Multidisciplinary Tumour Boards, providing valuable perspectives on complex cases.

The number of medical oncologists, oncologic surgeons, hepatologists and other referring physicians attending ECIO has doubled, rising from 18% of the overall number of participants in 2013 to 36% in 2014. This year's conference also attracted radiographers, nurses and physicians-in-training.

LEADERS IN ONCOLOGIC INTERVENTIONS

Industry presence

As ever, ECIO enjoyed much support from its corporate partners. The technical exhibition featured 25 exhibitors, who were available to discuss their latest products and advances with participants. Six satellite symposia were held during the three-and-a-half-day congress.

Scientific highlights

Innovation and new horizons were a running theme throughout the meeting. This year's honorary lecturer, Prof. Riccardo Lencioni (Pisa/IT) addressed the theme *20 years of Interventional Oncology, and future trends for 2020,* painting an exciting picture of what the future holds for this discipline. Other sessions, such as the New Horizons sessions, examined individual modalities and therapies in a more targeted manner, and a summary of the most exciting advances can be found overleaf…

Current & Future Trends

A series of lectures offered the opportunity to reflect on how far interventional oncology has come, what the status of particular techniques and approaches is, and what aspects of the field hold the most promise for the future.

Honorary Lecture

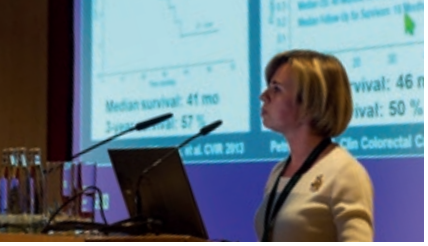
Prof. Riccardo Lencioni (Pisa/IT) delivered the 2014 Honorary Lecture, entitled *20 years of Interventional Oncology, and future trends for 2020*. Beginning with a look back at the field's rather limited scope merely two decades ago, the lecture underscored just how quickly interventional oncology is growing.

In the 1990s, interventional efforts in the field of oncology entailed just one clinical application – HCC – and two novel procedures: transarterial chemoembolisation (TACE) and percutaneous ethanol injection (PEI). The oncological world was initially skeptical, but active clinical practice soon led to increased awareness. By 2003, trial results regarding TACE and RFA were sufficiently convincing for interventional oncology to be incorporated into clinical practice guidelines on HCC.

The field rapidly evolved. Drug-eluting beads and the introduction of Y-90 microspheres were particularly important milestones. RFA was soon challenged by alternative approaches, including microwave ablation (MWA) and irreversible electroporation (IRE), permitting doctors to offer a spectrum of procedures and tackle tumours previously considered off-limits.

Current efforts are focusing on combining loco-regional and systemic treatments with new drugs. Although trial end-results have been disappointing, a nuanced look shows that some combinations (such as TACE with Sorafenib or RFA with ThermoDox) hold strong potential. A wave of ongoing trials (most involving Sorafenib and Y-90) may bring further changes. There have also been important advances outside of HCC, with ablation now used to treat lung tumours, and results comparing well with radiation therapy or medical oncology regimens. The treatment of small renal tumours has also evolved.

But recognition of such progress remains limited. For IR to fully establish itself as the fourth pillar of cancer care, Prof. Lencioni posited, interventionists need to be vocal about their contributions and, most importantly,




produce more data. He added that the current emphasis on patient quality of life – as opposed to mere survival – made the time for doing so particularly ripe.

Ablation technologies: current status and future horizons

Dr. Laura Crocetti (Pisa/IT) noted that **RFA** has matured into a flexible technique, with impressive long-term results in a variety of clinical settings. She detailed several such results, including studies on early-stage HCC showing 8-year survival rates in about 45% of cases, and ten-year survival rates in about 30%. Studies also reported 5-year survival rates for a high percentage of patients with renal cell carcinoma (73%). Results for lung carcinoma, one of the newest clinical applications, included a 5-year survival rate for 40%, and results were also promising with respect to pulmonary metastases of colorectal cancer. Moreover, research has also established RFA as a powerful palliative tool for patients suffering from bone tumours.

Nonetheless, room for improvement exists, and Dr. Crocetti singled out the use of gas-cooled RFA, combining RFA with doxorubicin, and synergies between RFA and DNA repair inhibitors as particularly promising.

Dr. Christian Stroszczynski (Regensburg/DE) described **IRE**, which has a certain selectivity for soft tissue such as tumour cells, while it is less lethal for nerves, fibrotic tissue and vessels.

The technique also differs crucially from RFA in that it involves no heat-sink effect and no thrombosis of smaller vessels. Data from early 2014 on the safety and efficacy of hepatic IRE shows surprisingly high percentages of secondary efficiency. But the technique does entail clear disadvantages, including that it is relatively time consuming; requires general anaesthesia; and is expensive, with generators particularly costly. Early-stage research suggests that IRE could be used to treat both pancreatic cancer and lung cancer, but Dr. Stroszczynski cautioned that further study was required regarding such broader uses. He noted that another potential application, prostate cancer, presented an especially interesting possibility.

Progress has undoubtedly been made in **MWA** in the past ten to twelve years, noted Dr. Thomas Helmberger (Munich/DE), particularly with the generators utilised. However, more improvements are needed, including with respect to the current design of needle probes.

Studies on tumours <3 cm show that MWA and RFA are comparable, and overall survival rates in HCC patients are similar after MWA and resection. But results comparing disease-free survival amongst patients treated with MWA alone and those who also undergo surgery show that the former is significantly inferior. All in all, there is relatively little data available, particularly with respect to large tumours. Dr. Helmberger concluded that the field's future is unclear, with available evidence comparatively sparse, treatment recommendations still hesitant to endorse MWA over other techniques, and the market forecast signalling limited industry confidence.

Dr. Irene Mindjuk (Dachau/DE) introduced **MRgFUS**, stating that it entails several benefits: it enables exact tumour location; allows visualisation of the treatment zone for avoiding critical structure damage; real-time thermometry is available for therapy control; and an immediate evaluation of ongoing therapeutic effects is possible during ablation.

The treatment of uterine fibroids has seen increasingly positive results due to less restrictive protocols and, more recently, to technological advances. Improvements include acoustic beam shaping, which makes it possible to selectively disable elements, and automatic movement detection. With respect to functional focused ultrasound neurosurgery, Dr. Mindjuk noted that MRgFUS permits small, precision lesioning and highly accurate placement. Other benefits include that it does not require incisions, ionising radiation, drilling, sedation or hospitalisation. Results have been promising, and clinical uses such as Parkinson's disease and epilepsy are being investigated.

Dr. Franco Orsi (Milan/IT) presented **US-guided HIFU** as a new, virtually non-invasive local treatment alternative. The treatment length is usually shorter than with MRgFUS, but it does commonly involve general anaesthesia, particularly with abdominal tumours. The treatment entails real-time imaging, which permits changing the shape and volume of the ablation based on the tissue. Research shows that it provides a safe and feasible approach for treating solid tumours, both for debulking and palliative purposes, and even for pancreatic tumours.

Dr. Orsi stated that, in the future, the treatment could play a large role in treating breast cancer, possibly one day even replacing surgery.

He also noted that combining the use of ultrasound with the use of contrast media will likely contribute greatly to both improving instant feedback during the procedure and increasing its efficiency.

Dr. Peter Littrup (Detroit, MI/US) described **cryoablation** as an excellent treatment option, with visualisation just one of many benefits. The versatile procedure also entails lower pain both during and after the treatment; does not require general anaesthesia; and involves both few complications and extraordinary healing, with little scar formation. Moreover, it is associated with low recurrence rates for all tumour types, regardless of location. There is room for improvement with respect to the technology, however, with companies actively working on rendering the use of helium tanks unnecessary. Cost effectiveness also remains an issue.

Dr. Nikolaos Tselis (Offenbach/ DE) introduced **brachytherapy**, which kills tumours by placing a radiation source as close as possible to, and ideally into, the target. This is achieved by implanting a catheter into the tumour. The technique provides an alternative to local-ablative therapy, hyperthermal techniques and stereotactic external irradiation modalities. A particular benefit is the ability to individually shape the radiation dose that is deposited within a tumour. Using imaging and software that facilitate 3D reconstruction, doctors can specify that certain areas should not receive a dose above a certain amount, then use the software again to pre-calculate where the catheter has to be inserted and for how long it has to remain in place to ensure this result.

Ablation: adjuvant and neo-adjuvant therapy

Dr. Nahum Goldberg (Jerusalem/IL) tackled the troubling question of whether ablation – RF and others – can cause unwanted systemic effects such as increased **oncogenesis**. He noted that, even though this does not occur in the majority of cases, such growth is a reality in a "substantial minority", stating that experienced interventionists who carry out many procedures will generally encounter cases that involve explosive tumour growth post-RFA.

Based on early research results, Dr. Goldberg posited that using anti-cytokine drugs to reduce such unwanted systemic effects presents a potential solution. At this point, an important step is for interventionists

to focus on better understanding the processes of organ homeostasis and residual tumour growth in order to come up with ways to avoid tumour initiation; eventually, future pharmacologic manipulation could help improve outcomes.

Dr. Nancy Kemeny (New York, NY/US) presented results from a wealth of studies scrutinising the roles of **adjuvant, neo-adjuvant and conversion therapy** in the treatment of colorectal liver metastases. Regarding adjuvant therapy consisting of chemotherapy following colon resection, she noted that only one agent, FOLFOX, entailed positive results in terms of disease-free survival.

As for adjuvant therapy after liver resection, proceeding with adjuvant hepatic arterial infusion and systemic treatments as opposed to systemic treatments alone, trials did demonstrate a significant increase in hepatic and overall disease-free survival with the former in a majority of randomised trials.

In addition, Dr. Kemeny concluded that liver-directed therapies should be considered for liver metastases, especially for purposes of conversion.

Dr. Martijn den Brok (Nijmegen/NL) outlined developments in **combining ablation with immunotherapy** to more effectively fight cancer.

Current lab-based immunotherapy investigations in metastatic melanoma have shown good results, but the process used is particularly laborious. Therefore, immunologists are investigating the creation of an *in vivo* dendritic cell (DC) vaccine. This requires three steps – antigen loading of DC *in vivo*, maturation of DC *in vivo*, and induction of long-lasting immune responses – and research is showing that it is feasible.

Step one is done via *in situ* tumour destruction, and results indicate that combining ablation with CpG, a synthetic nucleotide sequence, creates powerful synergies that benefit immunity.

Moreover, for inducing long-lasting responses, adding Ipilimumab, an anti-CTLA4 antibody, right after ablation increases the potency of the

immune response. While most currently available data focuses on combining this approach with cryoablation, research efforts are also exploring the use of HIFU and other techniques.

Dr. Sergio Dromi (Bethesda, MD/US) also discussed investigations into how treatments that destroy tumours can be rendered more potent by combining them with various **immunotherapies**.

Specifically, Dr. Dromi explained that current research is looking into enhancing immune reactions that result post-ablation by combining the procedure with immunotherapies involving the use of Sorafenib; injecting a manipulated, oncolytic virus; using Glypican 3, a protein in the surface of HCC cells; and the use of anti-CTLA4.

Early results indicate that, both by themselves and in combination with ablation, these constitute important tools in the treatment of HCC and other solid tumours.

Presentations are available at ***www.esir.org***

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Professional Issues in IO

Today's interventional radiologist is required to demonstrate more than just extensive theoretical knowledge and technical expertise. Being a fully-fledged clinician involves a whole range of other equally important tasks and skills, such as follow-up care, multi-disciplinary co-operation, quality assurance and data collection.

Several sessions focused on these fundamental topics, including the joint sessions with ESTRO (the European SocieTy for Radiotherapy and Oncology) and EORTC (the European Organisation for Research and Treatment of Cancer).

Interventional oncology and radiation oncology: combination or competition?

Radiation oncologist Dr. Philip Poortmans (Tilburg/NL) started the joint session with ESTRO by outlining various radiation therapies such as external beam radiation therapy (EBRT), intensity-modulated radiation therapy (IMRT) and stereotactic body radiation therapy (SBRT). These therapies enable more precise radiation delivery to the tumour, while sparing any healthy surrounding tissue and causing fewer side effects. Dr. Poortmans proposed that potential combination options should be discussed in a multidisciplinary team.

According to Prof. Roberto Orecchia (Milan/IT), combining external radiation therapy with percutaneous ablation might be a promising approach; however, so far there is limited data to support this. He pointed out that these therapies could complement each other by applying their specific strengths to the other therapy's weakness, e.g. areas that are less suitable for SBRT could be treated with ablation.

The long-established method of brachytherapy was presented by Prof. Peter Hoskin (Northwood/UK), who spoke about its development and current applications. During the treatment, the radiation source is placed as close as possible to the lesions to be treated, which are mainly breast, cervix and prostate tumours. Over the years, brachytherapy has integrated radiology in its application, so today radiation can be applied very precisely thanks to highly advanced image guidance.

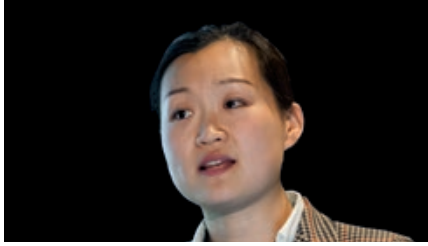
Prof. Jens Ricke (Magdeburg/DE) took up this topic and discussed the role of percutaneous brachytherapy in liver tumours. He recommended collaboration between IRs and ROs, stressing that IRs can make a major contribution due to their comprehensive imaging knowledge. Prof. Ricke finished his lecture with several examples showing that brachytherapy is a very effective method, offering excellent local control and freedom from local progression.

Dr. Federico Collettini (Berlin/DE) addressed a different clinical application: percutaneous brachytherapy in lung tumours. Both endobronchial and interstitial brachytherapy show very favourable results for patients who are not suitable for resection. Dr. Collettini compared endobronchial brachytherapy (EBB) to external beam radiation therapy (EBRT), concluding that EBRT alone is more effective and there is no decisive evidence to support combining these two.

Outcome measures and quality assurance

This session featured the expertise and perspectives of a variety of clinical specialties. Neuroradiologist Dr. Yan Liu (Brussels/BE), who currently works as a medical fellow at the EORTC headquarters, examined the importance of quality assurance and clinical trials. Healthcare is moving towards a more data-driven approach and biomarkers are thus playing an increasing role. EORTC's vision is to move trials "designed to learn" to real-life situations and to establish vital new partnerships with companies, patients and especially with societies such as CIRSE.



Radiation oncologist Dr. Lizbeth Kenny (Brisbane, QLD/AU) opened her lecture by emphasising the need to start thinking beyond traditional outcome measures, which only take into consideration five-year survival rates, anatomic imaging and RECIST criteria.

The goal is to achieve cure at the lowest possible burden for the patient and at minimal cost to the system. The key for achieving this is comparative effectiveness research, to determine which interventions work best for whom in a real-world environment.

Dr. Kenny expressed the view that this is an ideal opportunity for CIRSE to establish appropriate outcome measures, which should centre on tumour control, quality of life and economic burden. Such guidelines would also help demonstrate the specialty's willingness and ability to shoulder clinical responsibility for their oncology patients.

The topic of research in interventional oncology was addressed by Prof. Riccardo Lencioni (Pisa/IT), tying in with the themes explored in his Honorary Lecture. In 2005, SIR developed a 10-year vision statement, which aimed to expand research and gain more recognition for this fledgling field. Almost ten years later, interventional oncology has come a long way and has developed new techniques and treatments; however, it is still not fully acknowledged as a medical specialty. Therefore, it is critical that more research and randomised controlled trials be conducted to produce evidence and to enhance interventional oncology's credibility, thus establishing it as the fourth pillar of cancer care.

Running a clinical trial

To further encourage IRs to get actively involved in clinical research, ECIO invited experts from the European Organisation for Research and Treatment of Cancer (EORTC) to host a joint session.

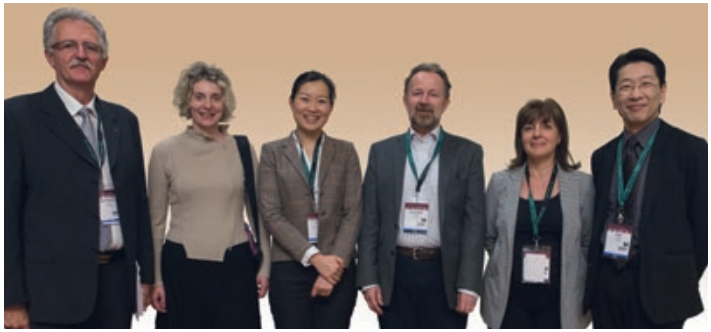
Prof. Patrick Bourguet (Rennes/FR) began the joint session by summarising the challenges facing clinical cancer research today. Due to major leaps forward in our knowledge of cancer mechanisms and pathways, new therapeutic approaches and classifications of tumours have been developed, which have led to the concept of personalised medicine. Research nowadays is increasingly focused on genomics, and 50% of today's trials involve the collection of DNA. This has had an effect on the design of clinical trials, which now take into account the genomic profile when selecting patients. Prof. Bourguet suggested that trials should focus more on the patients' quality of life and that clinical research requires centralised data management conducted by professional organisations.

The use of biomarkers in clinical trials was discussed by Dr. Yan Liu (Brussels/BE), who defined biomarkers as more objective indicators of normal biological processes, as opposed to clinical measures of how the patient feels and functions. There are two types of biomarkers, namely biospecimens, which are fluids (e.g. blood and urine) or solid tissue (e.g. excised tumour), and imaging biomarkers, which are biosignals measured *in vivo* with imaging devices. Despite their benefits, the use of biomarkers entails many challenges, including low reproducibility, high failure rates, and logistic difficulties – issues EORTC has started to address.

Biostatistician Dr. Murielle Mauer (Brussels/BE) described the methodology for conducting clinical trials, for which the gold standard is a randomised controlled triple-blind trial. She explained several methods to overcome bias, such as randomisation, a well-described protocol and data monitoring. Trial endpoints should focus on the benefit for the patient, which should be uniformly and objectively measurable in all patients. Dr. Mauer also advocated more efficient clinical trial design, with focused and relevant research questions, enhanced effect sizes and reduced variability.

Presenting the IR's perspective, Dr. Yasuaki Arai (Tokyo/JP) gave an overview of the endpoints in interventional oncology. While the goal of Phase I trials is to ascertain safety, and of Phase II trials to evaluate

efficacy, Phase III trials aim to compare therapies and identify optimal application criteria. In order to allow for meaningful comparison, IRs must utilise common oncological measurements and endpoints in their trial design – an essential consideration if IO therapies are to be more widely employed by the non-IR community.



Follow-up and clinical involvement

Multidisciplinary collaboration, data acquisition and follow-up were recurrent themes throughout the congress, and were addressed organically in many sessions. To underscore the importance of clinical visibility and patient-oriented care, a special Clinical Focus Session on *How to follow up patients* was also held. This featured examples of best-practice when treating HCC patients with Sorafenib or TACE, or performing bone, renal or lung ablation. A number of Multidisciplinary Tumour Boards also took place, enabling a thorough and professional appraisal of various clinical case types.

Presentations are available at ***www.esir.org***

Liver Cancer

IR procedures contribute greatly to the treatment of liver cancer, and the field is constantly evolving. Presentations at ECIO 2014 detailed the status of various approaches to HCC, identified potential areas for improvement and outlined promising research.

Novel advancements in locoregional therapies in HCC

Prof. Luigi Bolondi (Bologna/IT) discussed the realities of applying **available HCC guidelines** in clinical practice, noting that in a significant set of cases, it is not possible to use the first-option treatment.

For example, clinical practice for intermediate-stage HCC involves multiple approaches, including transplantation after down-staging; TACE alone, combined with percutaneous techniques or followed with Sorafenib; Sorafenib alone; and radioembolisation. But the algorithm specifies TACE as the only treatment option. This has prompted an effort to create sub-classifications (which are currently available for early-stage HCC), taking into account several factors such as liver function and the presence of portal vein thrombosis, and specifying alternative options.

Regarding advanced HCC, for which Sorafenib has been deemed the standard treatment, Prof. Bolondi noted that, contrary to expectations, the drug has not yet opened doors for other drugs. This is partly because the current standard mandates that these must be "non-inferior" to Sorafenib. Several trials are now instead exploring whether other drugs – including Regorafenib and Tivantinib – can at least be embraced as second-line options.

Prof. Riccardo Lencioni (Pisa/IT) addressed **chemoembolisation**, a well-established treatment, noting that the procedure has evolved, creating a need for new research, especially on the potential synergy between TACE and drugs.

He detailed the results of two such trials. The first scrutinised Brivanib as an adjuvant therapy after TACE in patients with unresectable HCC. This large, global trial indicated no real difference in outcome for patients also treated with Brivanib. However, it provided interesting new information on median survival for patients treated with TACE alone, indicating that this has risen to 26 months, and so providing a new benchmark. The second study explored using DEB-TACE alone versus combining it with Sorafenib. Although the end-results were disappointing, a sub-set of the results – from regions where the originally envisioned treatment plan was more strictly adhered to – suggests that a combined treatment can considerably improve overall survival. However, more evidence is needed.

Prof. Lencioni also pointed out that many of the recent studies on combining TACE with systemic therapies have failed, and posited that the time is right to focus on developing a global strategy for clinical trial design in HCC.




Dr. Bruno Sangro (Pamplona/ES) discussed **radioembolisation**, which still faces skepticism regarding its competitive efficacy for patients with intermediate or advanced HCC. Several ongoing trials are scrutinising the technique.

Results so far suggest that the technique is similar to TACE in terms of side effects, complications and overall survival (for typical TACE candidates). However, potential differences exist, including with respect to time-to-progression, cost effectiveness and certain patient subgroups.

Head-to-head comparisons of Sorafenib and radioembolisation indicate similar overall survival in mixed case series, but possible differences for patients with PVT or "bulky" intermediate-stage tumours, as well as with respect to cost effectiveness; and some definite differences, including in terms of side effects and complication rates. Trials comparing Sorafenib alone with radioembolisation and Sorafenib are also underway. Dr. Sangro posited that these trials could change the relevant management guidelines, but that only time will tell whether they actually do so.

Prof. Peter Galle (Mainz/DE) outlined the customary **treatment of intermediate HCC**, noting that TACE represents the standard of care, and that, where this fails or residual disease cannot be reached, Sorafenib becomes an option. Research on the efficacy of Sorafenib on Stage B patients clearly shows that it can be effective, with trials reporting overall survival rates between 14.5 and 20.6 months. Whether this means that the drug can compete with TACE is another question, and one currently impossible to answer in light of patient heterogeneity, particularly in terms of tumour burden, liver function, performance status and comorbidities. This impedes useful data comparisons, and renders more urgent plans to develop trial designs that address heterogeneity.

Early-stage HCC

Dr. Valérie Vilgrain (Clichy/FR) addressed the role of imaging in the **diagnosis of HCC**, focusing on patients with cirrhosis. She noted that, where lesions show hypervascularisation (where arterial supply increases, while portal venous supply decreases) and "wash out" (defined relative to the adjacent liver), imaging can suffice for purposes of diagnosing HCC.

For cases that do not share these two characteristics, other criteria – such as capsule or tumour growth – indicate a high likelihood of HCC, and a whole list of ancillary findings can provide further insight. Hepatobiliary MR contrast agents can also play an important role in the diagnostic process by showing hypointensity. However, these features do not always mean that a patient definitely has HCC, and so different manners of proceeding can be appropriate. Depending on the lesion size and location, as well as the likelihood of malignancy, options include treating the lesions without hepatologic proof, adopting a wait-and-see approach or, particularly with atypical lesions, performing a guided biopsy.

Dr. Alejandro Forner (Barcelona/ES) discussed what factors determine **which therapy to proceed with** once a patient has been diagnosed with HCC. The first step consists of evaluating the tumour burden, which involves gauging its stage, aggressiveness and growth rate. Determining to what degree liver function is impaired is also vital. The third factor is the patient's general health, which also considers the patient's own perception of symptoms.

Another important step is assessing the prognostic factors for a treatment before deciding on a specific intervention. Dr. Forner cited several examples, noting that, for transplantation, one of the most important criteria is the length of the hospital's waiting list, while for ablation, the size of the tumour is probably the most vital issue.

Dr. Vincenzo Mazzaferro (Milan/IT) stated that, in contrast to "resectability", **determining non-resectability** is relatively objective. Several conditions are generally accepted as precluding resection. These include situations where there is a high risk of an insufficient hepatic remnant and insufficient liver function; when the disease involves extensive, multifocal, bilobar tumours; in case of tumour thrombus in the major hepatic vessels; or extra-hepatic tumour spread. Determining whether these apply involves carrying out various tests and balancing several crucial factors, including investigating whether portal hypertension is an issue and evaluating results from an indocyanine green retention test.

Dr. Luis Bianchi Cardona (Barcelona/ES) emphasised that accurate **patient selection** is vital to ensure that ablation is successful, and described the best candidates for such treatment. These include patients without extra-hepatic disease with acceptable coagulation, whose cancer is in the early stage, preferably with tumours smaller than 3 cm. Ablation is also a possible bridge treatment for transplant candidates (if the wait is expected to exceed 6 months). Regarding treatment modality selection, patients with nodules larger than 3 cm are generally treated




with MWA. PEI has largely been replaced by RFA, though the two methods are still combined in some cases. Where ablation achieves a complete response, it is associated with a demonstrated positive impact on survival, but, as with resection, even with a complete response, the risk of recurrence is over 70% at 5 years.

Dr. Sang Joon Park (Daejeon/KR) noted that a donor shortage and the resulting waiting time for transplants often necessitates the use of **bridging treatments**, and addressed how to determine what treatments to rely on for bridging. The main goal is to avoid progression during the wait, which also helps prevent waiting list dropouts. Another aim is to reduce HCC recurrence and improve overall survival post-transplantation.

A total of eleven methods are available, including conventional TACE, RFA, PEI, MWA and radioembolisation. At this point, no solid evidence from randomised trial confirms that any particular approach is best, so ultimately, deciding which one to apply comes down to which treatment one's institution is most familiar with.

Other sessions

Dr. Constantinos Sofocleous (New York, NY/US) outlined the main steps involved in liver MWA in a video-learning session, using footage from ablation carried out on colorectal liver metastasis to illustrate these.

Two presentations addressed complications that can result from liver ablation. Dr. Laura Crocetti (Pisa/IT) noted that such complications are generally related to puncture of the liver or are energy-related. She presented cases in which she confronted puncture-related complications, and concluded that haemorrhage requiring treatment is not common, with an incidence of 0.4-0.5% after ablation; and that embolisation often represents a successful therapeutic option.

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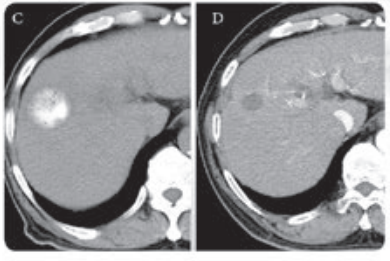

(C) Plain CT 1 day after using superabsorbent polymer microspheres (SAP-TAE) shows retention of contrast medium in the treated tumour. (D) After one session of SAP-TAE, including contrast-enhanced computed tomography at 3-year and 2-month follow-ups showed nonenhanced tumour with a marked reduction in size, indicating a complete response.[1]

1 Osuga, K., et al. (2008). Bland Embolisation of Hepatocellular Carcinoma Using Superabsorbent Polymer Microspheres. Cardiovasc Intervent Radiol 31:1108–1116; doi:10.1007/s00270-008-9369-6.

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Dr. Shaun Samuels (Miami, FL/US) also noted that major complications are extremely uncommon, and that most can be managed by interventionists themselves. Only rarely is surgery required. He posited that the best management technique is to avoid carrying out ablation on patients who are at an increased risk of complications, noting, for example, that PEI or laparascopic ablation could be more advisable for surface or sub-capsular lesions. Furthermore, he pointed out that management options ultimately boil down to four choices: coil embolisation, drainage and, more rarely, transfusion and surgery.

How to follow up patients

In a session dedicated to patient follow-up, Prof. Jeff Geschwind (Baltimore, MD/US) discussed the use of Sorafenib for systemic therapy of HCC, and the mRECIST criteria for evaluating tumour response. Studies on combining locoregional therapy and Sorafenib are underway and results should be available by the end of this year.

Dr. Marta Burrel (Barcelona/ES) dealt with the topic of TACE for intermediate HCC. Due to the problem of residual disease after TACE, the use of criteria such as mRECIST and EASL is recommended. Dr. Burrel noted that there are no defined protocols for follow-up and re-treatment strategy.

*Presentations are available at **www.esir.org***

Kidney Cancer

Ablation has been a force for change in the treatment of renal cell carcinoma since 1998, and more recent advances have increased its potential. At ECIO, renowned IRs discussed new developments in the field of kidney cancer care.

Changing indications for ablation

Prof. Debra Gervais (Boston, MA/US) began her presentation by emphasising that the indications for kidney tumour ablation have changed, facilitating ablation of larger tumours. Surgery still remains the standard of care; however, poor surgical candidates – patients with comorbidities, a solitary kidney or multiple renal cell carcinomas – may be treated with ablation.

Prof. Gervais discussed the changing indication of tumour size, which has shifted from ≤3 cm to ≤4 cm thanks to rapidly developing technology and extensive operator experience, and presented multiple studies showing successful complete ablation of tumours ≤4 cm. This new indication has been adopted into major guidelines.

Managing ablation in patients with recurring RCC

Dr. Jean Michel Correas (Paris/FR) addressed the issue of recurring RCC, stressing the importance of a multidisciplinary team decision on the optimal choice of therapy. A multimodal approach combining surgery and targeted therapy ensures the best survival outcomes. Recurrent RCC

is defined as a new renal tumour after initial RCC treatment, a local recurrence in the same or contralateral kidney, or as a metastatic recurrence in other locations such as lung, bone or brain. At diagnosis of RCC, 20-30% of patients have already developed metastases.

Ablation also plays a part in recurrent RCC, mainly with the aim of preserving renal function, limiting complications and reducing pain and hospital stays. At metastatic sites, ablation can be combined with other treatments, such as surgery, to completely eliminate the tumour. Ablation alone is not as effective in recurring RCC as it is in primary RCC, however, the role of ablation in multimodal treatment is growing.




Comparing ablation techniques

A comparison of RFA, MWA and cryoablation was presented by Dr. Matthew Callstrom (Rochester, MN/US), focusing on the effectiveness, complications, disadvantages and advantages of these methods. He described the ideal lesion as peripheral (due to low bleeding risk), remote from the ureter (which decreases the risk of thermal injury), and ≤3 cm in size. Such lesions represent around 50% of tumours treated.

Multiple studies have shown that RFA and cryoablation both have similarly high local control rates (over 90%). Complications such as ureter or nerve injury appear to be more common with heat-based ablation, whereas haemorrhage appears more frequently with cryoablation. Dr. Callstrom concluded that all three methods are effective and safe for small renal masses, with cryoablation demonstrating advantages for larger masses.

Prevention and management of complications

Dr. David Breen (Southhampton/UK) explained the key points for the prevention and management of complications in kidney ablation. While solitary kidneys are not a contraindication, and anterior vs. posterior location is a not an indicator of outcomes, other factors greatly influence the complication rate. It is crucial to attend multidisciplinary team meetings, obtain formal anaesthetic support and choose the appropriate patient positioning to avoid brachial plexus injury. In lesions >3 cm, cryoablation offers more contiguous ablation zones.

Based on his experience, Dr. Breen gave suggestions and recommendations for avoiding certain complications. The use of prophylactic stenting, air isolation and increased watchfulness can prevent injury to the pelvi-ureteric junction. To avoid gut injury, adequate time should be taken on contrast-tinted hydrodissection, and energy deposition should be controlled. Diligent image guidance and general anaesthesia further help to decrease the chance of complications.

Patient follow-up

Prof. Nicolas Grenier (Bordeaux/FR) discussed the follow-up of kidney ablation patients based on clinical, biological and imaging parameters. Although immediate follow-up is not standard, certain parameters should be measured, and patients experiencing lumbar or abdominal pain, or haematuria should undergo early CT/MRI. Early post-ablation imaging is controversial if no clinical or biological disorder is present.

After 2-3 months, a follow-up scan should be performed with either CT or MRI in order to document technical success, residual tumour or complications. Subsequent imaging in the first five years differs for low-risk and high-risk patients, with the latter group relying on a multidisciplinary team to make the decision. Both MRI and CT are suitable techniques for imaging follow-up, each offering advantages and disadvantages.

In another session dedicated to clinical and imaging follow-up of patients, Prof. Debra Gervais (Boston, MA/US) also gave an overview of key considerations after renal ablation. The most commonly encountered complications are post-ablation syndrome, pain and haemorrhage. Prof. Gervais advised that the first scan be performed at one month to assess the zone of ablation, as well as changes in tumour size, absence of enhancement and additional lesions. Any recurrences can usually be re-treated with ablation, although it is debatable whether to ablate or resect. Prof. Gervais emphasised that follow-up is more than just imaging and that IRs need to understand and interpret both imaging and non-imaging aspects if they are to provide the most effective care.

Combined therapies

The possibility of combining therapies in kidney cancer treatment was explored by Prof. Bernhard Gebauer (Berlin/DE). Thermal ablation could potentially be enhanced by anti-angiogenic drugs, temperature-sensitive liposomal delivery, embolisation and urological techniques. Radiation-based therapies could be supported by radiosensitising drugs.

RFA with anti-angiogenic drugs has been tested on mice with positive results, however, clinical patient data is lacking. Embolisation in combination with RFA (the efficacy of which has already been established for HCC) has so far only been evaluated in case studies and retrospective analyses, which indicate potential benefits. Prof. Gebauer pointed out that there is no clinical data for combination treatments to date; however, they offer a promising approach worth investigating.

Other sessions

A Video Learning Session and a Hands-on Workshop were also dedicated to the topic of kidney tumour ablation. Dr. Breen (Southampton/UK) demonstrated in a video how cryotherapy is performed in his clinic, while Dr. Buy (Bordeaux/FR), Prof. Gervais (Boston, MA/US) and Prof. Veltri (Orbassano/IT) led an interactive hands-on workshop on ablation.

Lung Cancer

Lung cancer has been an area of interest in interventional oncology for many years and new techniques and applications are continually emerging. In a dedicated Clinical Focus Session and various other sessions, IRs and radiation oncologists discussed treatment methods, complications and follow-up of lung tumours.

Evaluation of lung function

Radiation oncologist Prof. Roberto Orecchia (Milan/IT) presented an overview of surgery, stereotactic body radiation therapy (SBRT) and RFA for pulmonary lesions, and the recent advances that have been made in each field.

Data on their use in a pulmonary setting is scarce, but a recent comparative study suggests that SBRT achieves better expiration volumes and entails a slightly lower mortality rate than RFA or sublobar resection, although a lack of uniformity in age and co-morbidities make meaningful comparison difficult. However, Prof. Orecchia spoke enthusiastically about the advances in all three fields, and stressed the need for standardised treatments and new controlled studies, especially ones addressing toxicity and quality of life.

Stereotactic body radiation therapy

Dr. Reinhard Wurm (Frankfurt/DE) examined SBRT more closely, giving an overview of current lung cancer prevalence and what SBRT brings to the treatment arsenal. SBRT is an extra-cranial radiation therapy which is delivered in a single or small number of fractions, and allows high-precision and high-target doses, as well as the possibility to control for target motion.

Despite its advantages, it also has limitations concerning the uncertainty of target definition, dose escalations and the inaccuracy of patient positioning. Dr. Wurm compared surgery to SBRT, concluding that both treatments have similar results, rendering SBRT an alternative to surgery. However, there are no completed clinical trials yet and surgery is still considered the gold standard.

Lung ablation

Dr. Christof-Matthias Sommer (Heidelberg/DE) focused on the topic of primary lung tumour ablation. The standard of care for primary early-

stage lung tumour is still surgery, but patients with comorbidities, who are poor surgical candidates, can benefit from ablation. Dr. Sommer discussed several ablation techniques, such as RFA, MWA and the newly emerging irreversible electroporation (IRE), which still lacks conclusive data. He proposed that lung cancer patients should be evaluated by an interdisciplinary team and that ablation requires more randomised controlled trials due to its uncertain efficacy.

Lung metastases

Lung metastases are a common occurrence in cancer patients, and Dr. Stephen Solomon (New York, NY/US) outlined the surgical and ablative treatment options available. The retrospective data on surgery was only available as a result of international registries, and he urged IRs to follow suit. Nonetheless, ablation offers a number of advantages to the metastatic patient: it entails few complications, preserves lung function, has short recovery times and is repeatable, and is thus an option that should be considered by the multidisciplinary team when treating chronic disease.

Embolisation of lung cancer

Dr. Tarun Sabharwal (London/UK) discussed the possibility of vascular interventions for the palliation of lung cancer. Lung metastases are supplied by the pulmonary artery, whereas primary tumours receive their supply from the bronchial artery, and both these arteries can be targeted by embolisation. Dr. Sabharwal first presented a multitude of cases from his own experience, followed by cases from other centres, of which he only found a limited number. Embolisation is mainly used for symptom control for bleeding in patients with lung metastases, but the use of palliative embolisation in primary cancers should also be considered.

Clinical pearls

In a joint session with the WCIO, Dr. Constantinos Sofocleous (New York, NY/US) outlined five pearls of clinical wisdom on achieving safe lung ablation with clear margins. Beginning with optimal tumour and patient selection, he explained that solitary pulmonary tumours <2 cm respond




best, and stressed the importance of restaging using PET-CT prior to the procedure. Having a clear ablation plan that includes patient positioning, tools and devices, needle trajectory and protective techniques is equally important, and can help avoid brachial plexus injuries and non-target ablation. Thirdly, Dr. Sofocleous advised having an anaesthesiologist present, as this allows IRs to give their full attention to the ablation.

Safety was also discussed, with tips on how to avoid collateral damage and minimise transgression of the pleura. Finally, Dr. Sofocleous stressed the importance of operator competence and technique. IRs should use devices they are familiar with, and employ overlapping ablation zones and peri- and post-ablation monitoring. Ablation with curative intent should only be offered when clear margins can feasibly be achieved.

Follow-up

The follow-up routine for lung ablation was described by Prof. Damian Dupuy (Providence, RI/US), who spoke about procedural pain, complications and pulmonary function. While RFA can affect pulmonary function in the short-term (due to pleurisy), Dr. Dupuy's multi-centre trial group found no negative effects at 3 and 24 months, and actually an increase in forced vital capacity post-RFA. Dr. Dupuy suggested that it is possible to roughly predict outcomes by observing comorbidities – in the studies presented, patients with less comorbidity, smaller tumours and better performance status had very high survival rates.

Complications

Prof. Robert Suh (Los Angeles, CA/US) and Dr. Alison Gillams (London/UK) discussed the most frequent complications of lung ablation. Pneumothorax is the main complication, but it can be avoided with oxygen and blood administration, quiet respiration, and adequate pain control and sedation. The second most frequent complication is pleural effusion, which can be prevented by exercising particular caution. If it does occur, several methods, such as observation, thoracentesis and pleural catheter placement, can be employed. Pain is managed with anti-inflammatory agents, narcotics, anti-convulsant drugs, intercostal nerve block, and hot or cold packs. Pseudo-aneurysms and delayed acute haemoptysis are very rare, and cavitation can occur in large ablation but does not necessarily indicate infection.

Other sessions

A Hands-on Workshop also addressed tumour ablation in the lung, and Dr. Thierry de Baère (Villejuif/FR) guided the audience through a lung cryoablation in a Video Learning Session.

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Bone Cancer

Interventional oncology is increasingly playing a role in the palliation and cure of bone tumours and metastases. Experts examined different aspects of the topic in a variety of sessions ranging from a Clinical Focus Session to a Multidisciplinary Tumour Board and Video Learning Sessions.

Radiation therapy

Radiation oncologist Dr. Lizbeth Kenny (Brisbane, QLD/AU) discussed the significance of radiation therapy for the treatment of bone tumours. For unresectable tumours, radiation therapy can often provide long-term local control, whereas for resectable patients it is only used as an adjuvant therapy. Dr. Kenny listed breast, prostate and lung cancer as the most common malignancies from which bone metastases develop. These are mostly found in the spine and pelvis.

Radiation therapy is often employed for palliative purposes, e.g. for plasma cell myeloma. Types of palliative radiation therapy include external beam radiation, targeted therapy and other radionuclides. Dr. Kenny also introduced the concept of stereotactic radiosurgery (SRS), which shows favourable results; however, further studies are required to assess pain relief and quality of life in comparison to external beam radiation therapy (EBRT). She concluded that radiation therapy is an effective method to relieve pain with minimal side effects and cost. It should always be taken into consideration when treating bone metastases.

Focused ultrasound

Prof. Wladyslaw Gedroyc (London/UK) spoke about the role of focused ultrasound (FUS) in bone tumour care. He defined FUS as intense local heating which focuses on a relatively small area to heat and destroy the tumour tissue. Patients whose radiation therapy failed, who refused it or who had other contraindications for radiotherapy are the most suitable candidates for FUS treatment. Therapeutic results are achieved within a few days with minimal side effects, including minor bone weakening, skin injuries or fractures.




Dr. Gedroyc stressed that FUS does not preclude future treatments such as radiation therapy, surgery or ablation. So far FUS has only been used with palliative intent, mainly in long bones and the pelvis; however, its application could potentially extend to treating benign lesions or debulking primary bone neoplasms. Dr. Gedroyc added that because the treatment often results in sclerosis, it could possibly be beneficial for osteoporosis too.

Ablation in cure or palliation

The role of ablation in cure or palliation was discussed by Dr. Dimitrios Filippiadis (Athens/GR), who emphasised the necessity of defining whether the treatment is palliative or curative prior to the procedure. Before ablation, IRs must familiarise themselves with the patient's general condition, tumour histology and degree of bone destruction, as well as familiarity with the available equipment.

Curative indications mainly include benign lesions, but smaller, slow-growing malignant lesions can also be treated with curative intent. Palliative treatments aim to reduce pain, decompress and debulk the tumour and prevent fractures. Dr. Filippiadis emphasised the importance of thermal protection and knowledge of the relevant anatomy to prevent injuries. Ablation can be combined with other treatments such as surgery, chemotherapy, radiotherapy and osteoplasty.

Osteosynthesis and osteoplasty

Dr. Frédéric Deschamps (Villejuif/FR) gave an overview of percutaneous osteosynthesis and osteoplasty. Dr. Deschamps explained that his clinic started using this combined technique because cementoplasty alone failed to lead to the desired outcomes: pathological fractures still occurred despite the treatment. During osteosynthesis, screws are inserted percutaneously to stabilise the bone using C-arm guidance while the patient is under general anaesthesia or conscious sedation. This is followed by cementoplasty. The risk of fractures decreases significantly when these two treatments are combined. Surgery remains the gold standard for prophylactic stabilisation, but percutaneous osteosynthesis with osteoplasty is an excellent alternative due to its minimal risk of fracture and leakage.

Combining techniques

The combination of embolisation and ablation was examined by Dr. Julien Garnon (Strasbourg/FR), who argued that the treatments complement each other by overcoming their individual limitations. He outlined the various limitations to support his argument. The combined procedure should be carried out in two steps, starting with embolisation, which can be performed with C-arm guidance. For the ablation, it is advisable to use CT (with or without fluoroscopy) or 3D cone-beam

CT, which is followed by bone consolidation with screws to prevent fractures. Based on Dr. Garnon's experience, the procedure is effective for pain management and/or local control of hypervascular tumours; however, the literature is limited and further randomised controlled trials are necessary.

Follow-up

The topic of follow-up in patients with bone ablation was explored by Dr. Matthew Callstrom (Rochester, MN/US), who focused on pain control. To palliate metastatic disease, pain should be assessed and treated with opioid analgesic use. In the case of oligometastatic disease, the treatment goal is to achieve local control and long survival. Imaging follow-up is based on the disease and further imaging is only required if the symptoms change. Dr. Callstrom stressed that bone ablation follow-up should be approached in a multidisciplinary team.

Complications

Complications in bone ablations were addressed in two sessions by Dr. Dimitrios Filippiadis (Athens/GR) and Prof. Peter Littrup (Detroit, MI/US). Both underscored the importance of thermal protection such as thermocouples, hydrodissection or skin warming/cooling. Extensive knowledge of the anatomy including bowel, ureter and nerves is also essential. Prof.

Littrup recommended thorough planning of cryoablation with strictly defined guidelines – probes should be placed no further than 1 cm from all tumour margins, and the distance between the probes should not exceed 2 cm. Dr. Filippiadis remarked that complications are always possible but adequate training, knowledge of the anatomy, high quality imaging and proper patient selection can help prevent them.

Other sessions

Several other sessions addressed the topic of bone tumours, indicating the growing significance of interventional oncology for this malignancy. Dr. Laura Crocetti (Pisa/IT) and Dr. Alison Gillams (London/UK) coordinated an educational Hands-on Workshop on image-guided bone tumour ablation, while Prof. Afshin Gangi (Strasbourg/FR) led a Multidisciplinary

Tumour Board. Two Video Learning Sessions were offered, giving attendees the opportunity to watch and learn about specific procedures through this informative medium. Dr. Frédéric Deschamps (Villejuif/FR) demonstrated osteosynthesis and bone cementoplasty, and Prof. Gangi guided the audience through cryoablation.

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