



Top Cases 2022

Quality Ablation with
CAS-One[®] IR

Reproducible and Standardised Tumour Treatments with CAS-One® IR

In 2022 there were 1500 cases performed with CAS-One IR.

Each month, our team selects particularly interesting, complex, impactful cases that maximize the functionality of CAS-One IR. From there, one annual winner that truly stands out is selected.

We would like to congratulate **Dr. Michael Kerezsy** and the team in Passau for winning the Case of the Year in 2022.



Glossary

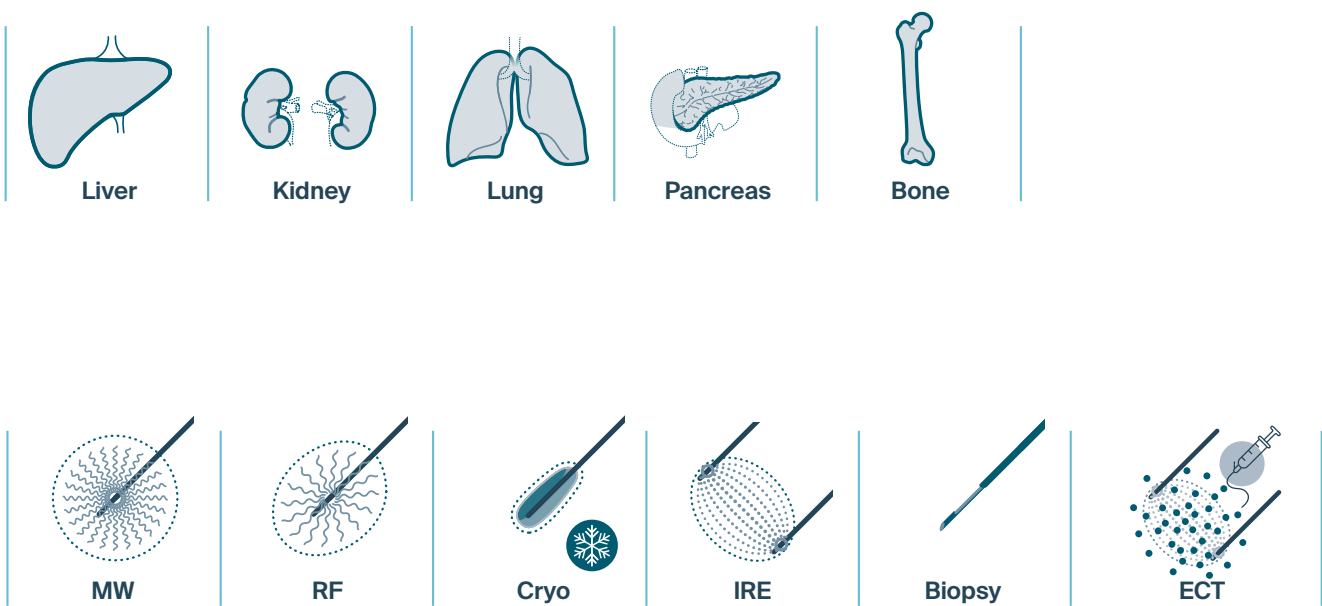


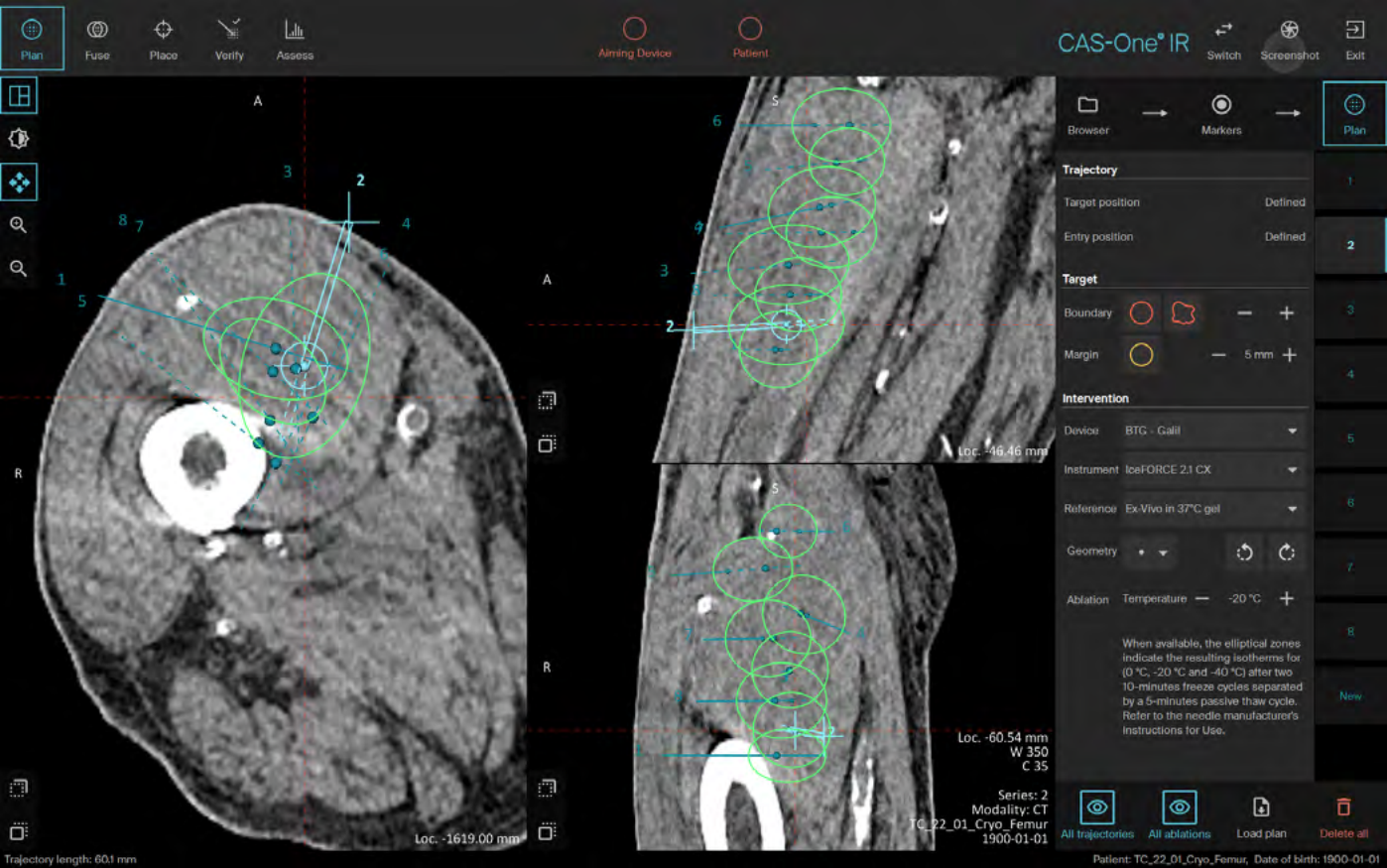
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Cryoablation of a polylobulated dedifferentiated liposarcoma in the right femur

Cryoablation of a polylobulated dedifferentiated liposarcoma of 12 × 7 cm of the quadriceps muscle. Treatment using eight ablation needles required great precision due to proximity of the tumour to the femoral nerve. Debulking intends to reduce symptoms by size reduction and softening of the tissue to mobilize the patient and improve quality of life.



Planning of eight cryo probes

Initial condition

- Initial diagnosis 2019 (NO, cM0)
- Radiation in 2019 with initial reduction of size of the tumour
- Tumour regrowth in 2021 with recurring symptoms of pain and skin tension over the tumour, inhibiting walking and reducing quality of life of the patient
- Repeated radiation was not indicated
- Increase of diameter of right thigh and pain upon pressure in the area of the tumour. Tension of skin over the tumour was clearly visible
- Indication for percutaneous tumour ablation as the patient refused surgery and systemic therapy

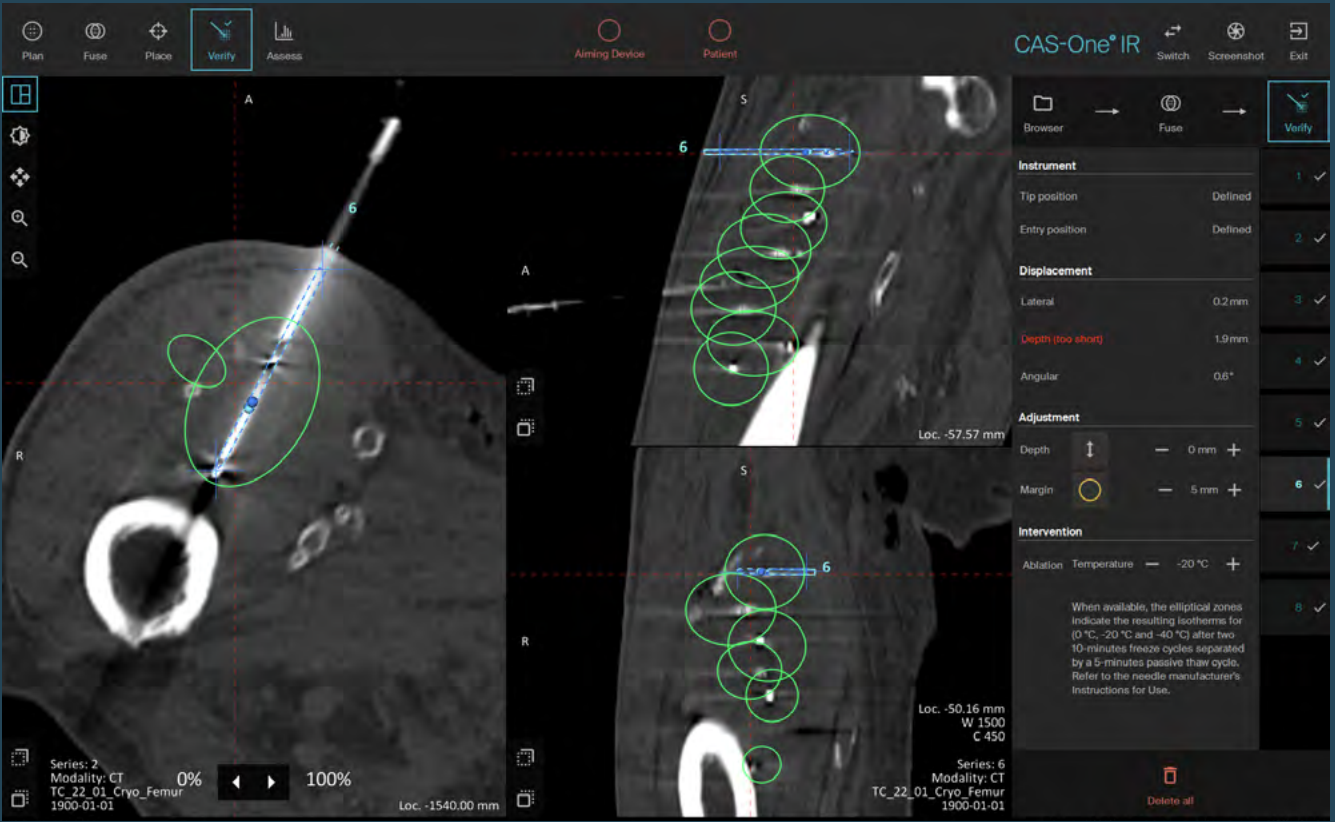
Treatment

- Accurate placement of all eight needles on first try with an average lateral error of 1.7 mm
- Probe placement was completed within 70 min. including two control scans

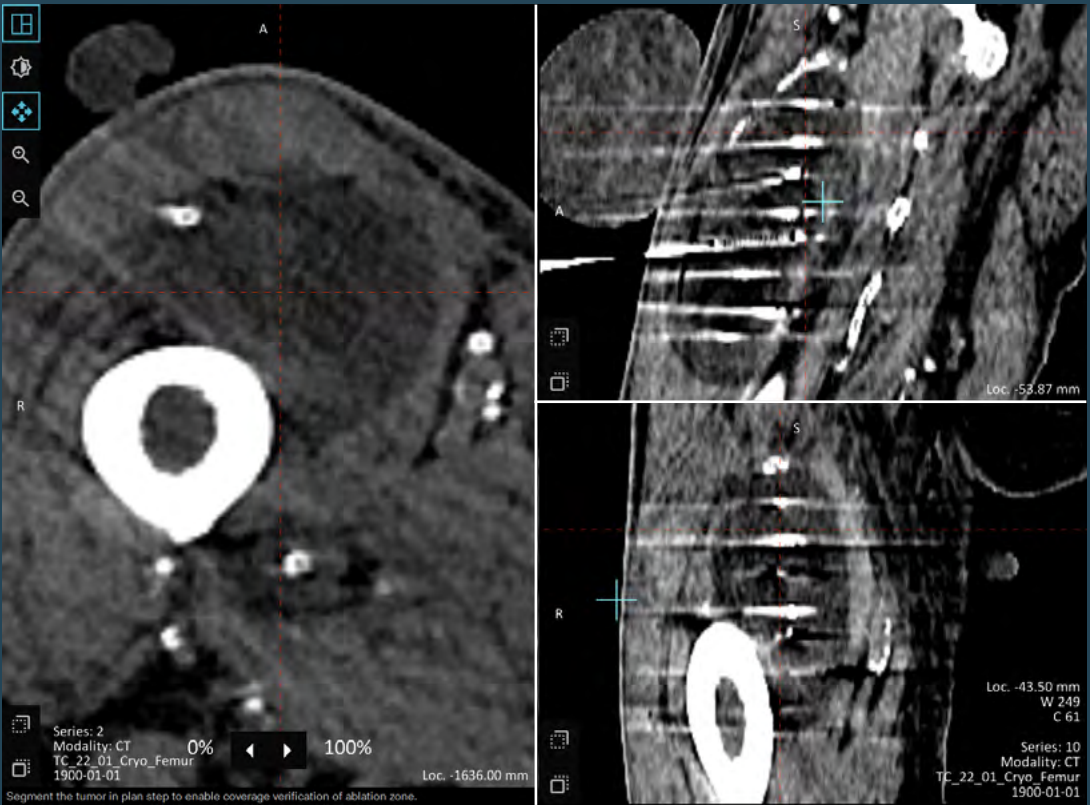
Conclusion

- Planning, navigation and verification of eight probes resulted in a complex clinical scenario
- Preplanning of the intervention started one week prior to treatment
- Access to the trajectories by avoiding previously placed probes is narrow but possible. Diligent planning and execution required
- Overall intervention time was four hours. The patient tolerated the intervention well
- Treatment was a technical success, as most of the tumour was covered with the cryoablation

Dr. Robyn M. Benz
Inselspital, Bern (Switzerland)



Verification of probe position

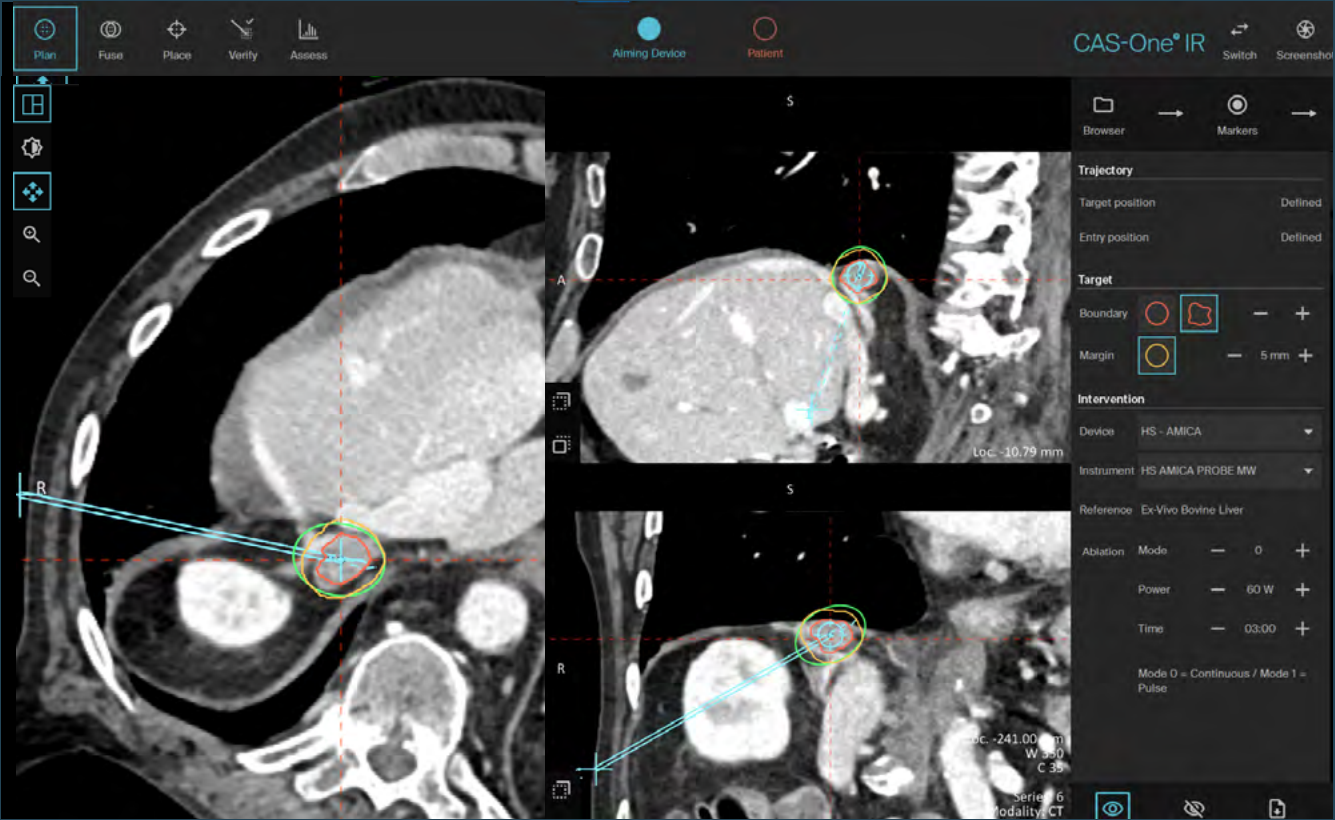
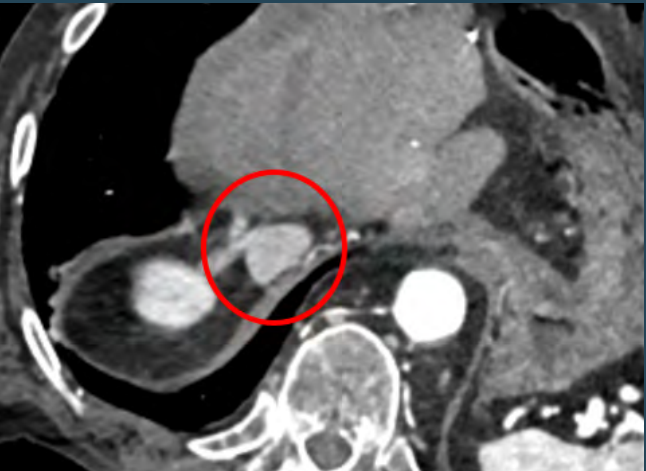


Imaging of freezing cycle also showing a sterile glove filled with warm water to protect the skin of the patient

Microwave ablation of an HCC metastasis adjacent to the right adrenal gland

Microwave ablation of a single HCC metastasis. The trajectory was planned in the very small space between the kidney and liver, going through fat tissue only until reaching the lesion adjacent to the right adrenal gland.

Preoperative CT showing hypervascular lesion in arterial phase



Planning scan in MPR view

Initial condition

- Patient was first diagnosed with HCC in 2016 with a non-cirrhotic liver
- First surgery in September 2016
- Patient developed several new lesions that were treated with a combination of resection and ablation in 2017, 2018 and 2019
- In 2020 a diagnosis of growing hypervascular lesion adjacent to the right adrenal gland and the diaphragm
- Multi-disciplinary team conference in January 2021 advocated ablation as surgery was not an option

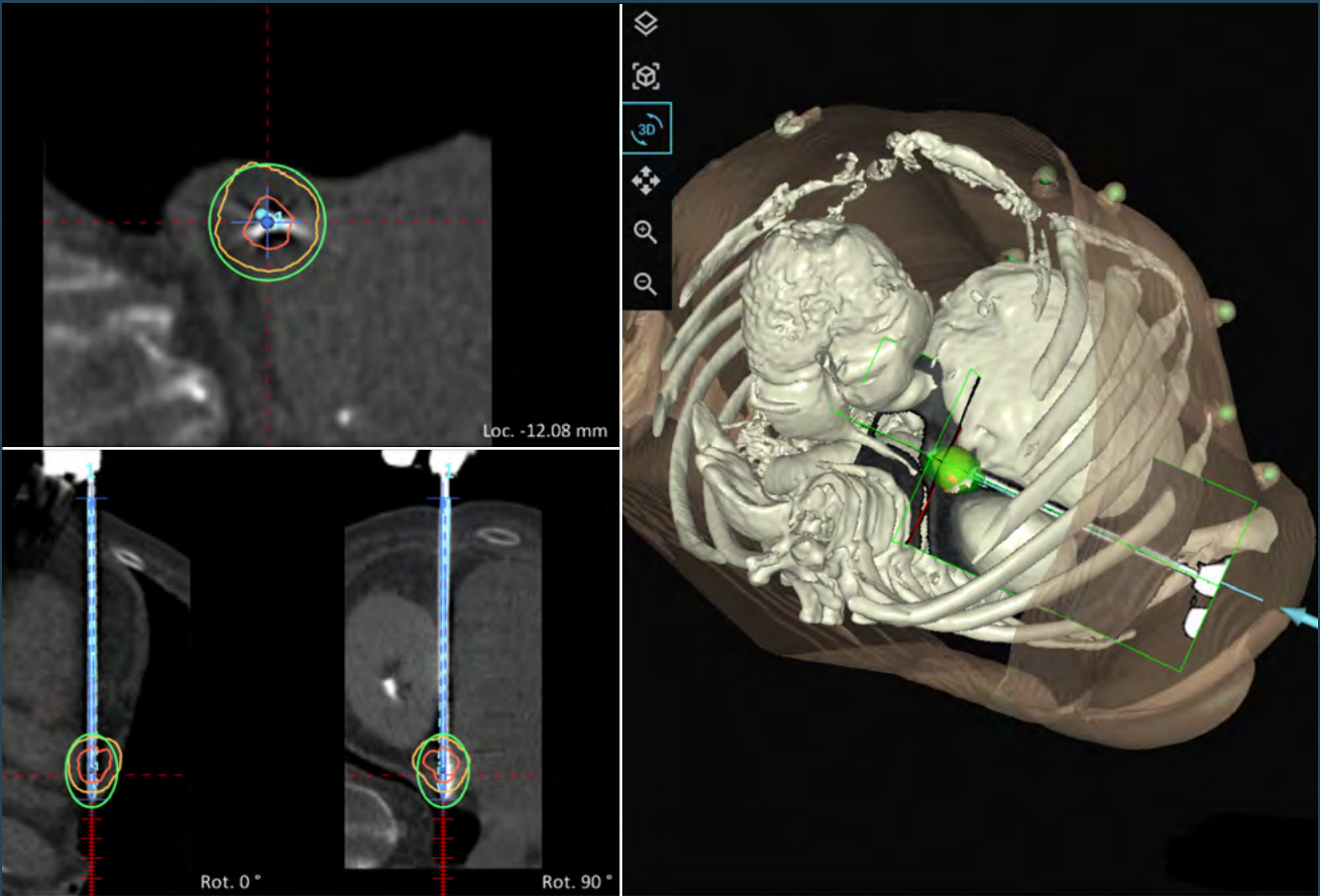
Treatment

- Intracostal, oblique access was chosen
- Planning involved puncturing neither the liver nor the kidney capsule and only passing intra-abdominal fat tissue
- The needle verification scan shows a highly precise placement with an exact execution of the plan

Result

- Control scan showed a retracted lesion with follow-up scan in November 2021 showing stable conditions without signs of regrowth
- Trajectory would have been extremely challenging without CAS-One IR navigation (over 13cm, double angulated, steep caudo-cranial, only small space between liver and kidney)
- Ablation zone expectation was very useful for a gentle treatment

Dr. Johan Lindeberg and
Dr. Niklas Fahlberg
Danderyd Hospital, Stockholm (Sweden)



3D needle eye view nicely showing the small window between kidney and liver for the trajectory

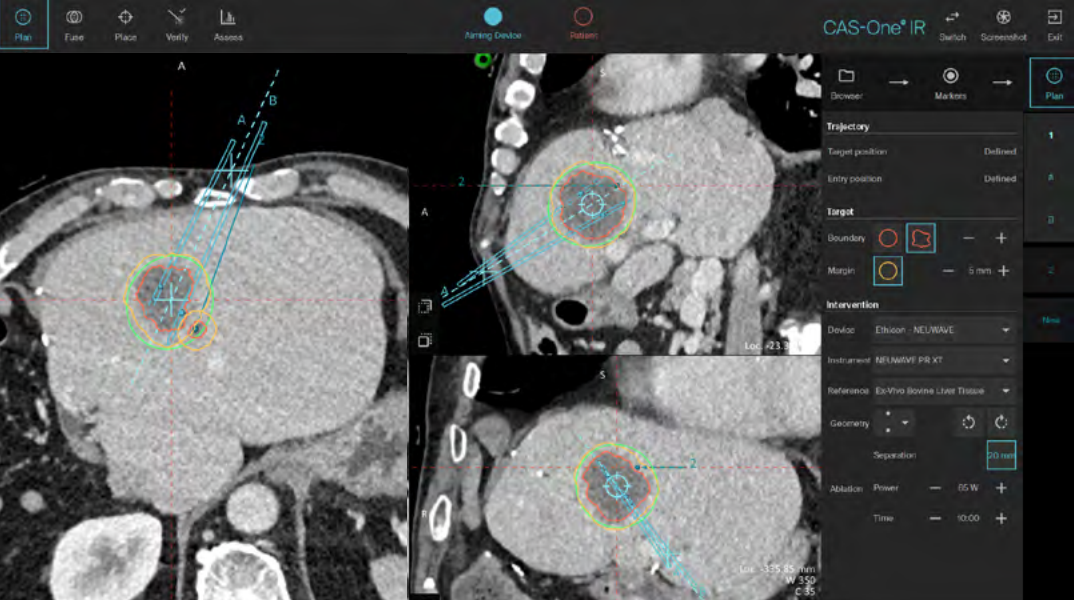


Follow-up scan November 2021 arterial phase

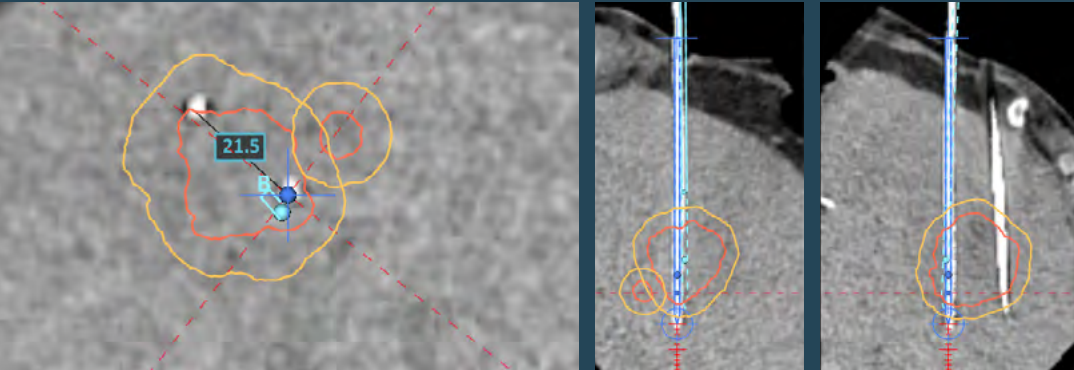
Two probe microwave ablation of a large liver metastasis

Tissue spearing MWA after extended right hemihepatectomy. Lesion, progressive in size to 43 × 36 mm at the time of the intervention, was fully covered by the ablation volume. In addition a 5-mm satellite tumour dorsocranial to the main lesion showed

in the planning scan. They were treated with a double needle configuration and repositioning after the initial ablation. In the postinterventional control scan, the lesion was completely covered without evidence of periinterventional complications.



Planning scan showing the two trajectories with the expected big ablation zone of the dual needle configuration



Needle verification scan of placed needles

Initial condition

- 2016: Initial diagnosis of a neuroendocrine tumour of the pancreatic head. Condition after laparoscopic enucleation
- 2017: During follow-up, hepatic space-occupying lesions were noted, as well as a stenosing space-occupying lesion of the right colonic flexur. Histological confirmation of the space-occupying mass of the colon (adenocarcinoma of the colon)
- 2017: right hemicolectomy, and atypical liver resection from liver segments II/III, III, and extended right hemihepatectomy (multi-stage procedure). Detection of hepatic metastases of adenocarcinoma of the colon in the intraoperative fast track samples
- November 2021: Newly appeared mass in the central residual liver (39 × 32 mm)
- December 2021: Tumour board decision for MWA

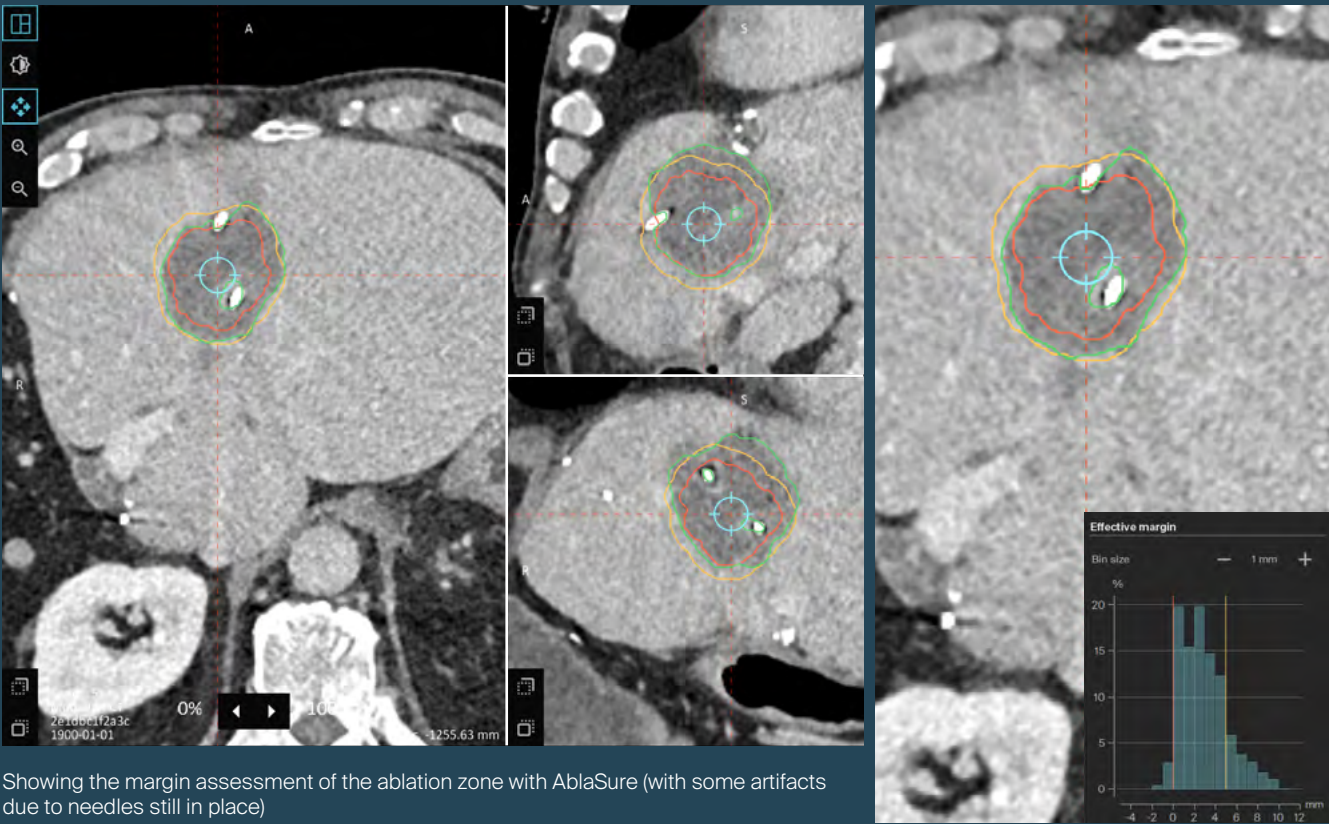
Treatment

- January 2022: Bioptic confirmation and MWA of the focus (pathology: metastasis of adenocarcinoma of the colon). Lesion was progressive in size to currently 43 × 36 mm
- A new 5-mm satellite dorsocranial to the main lesion was seen compared with the previous findings

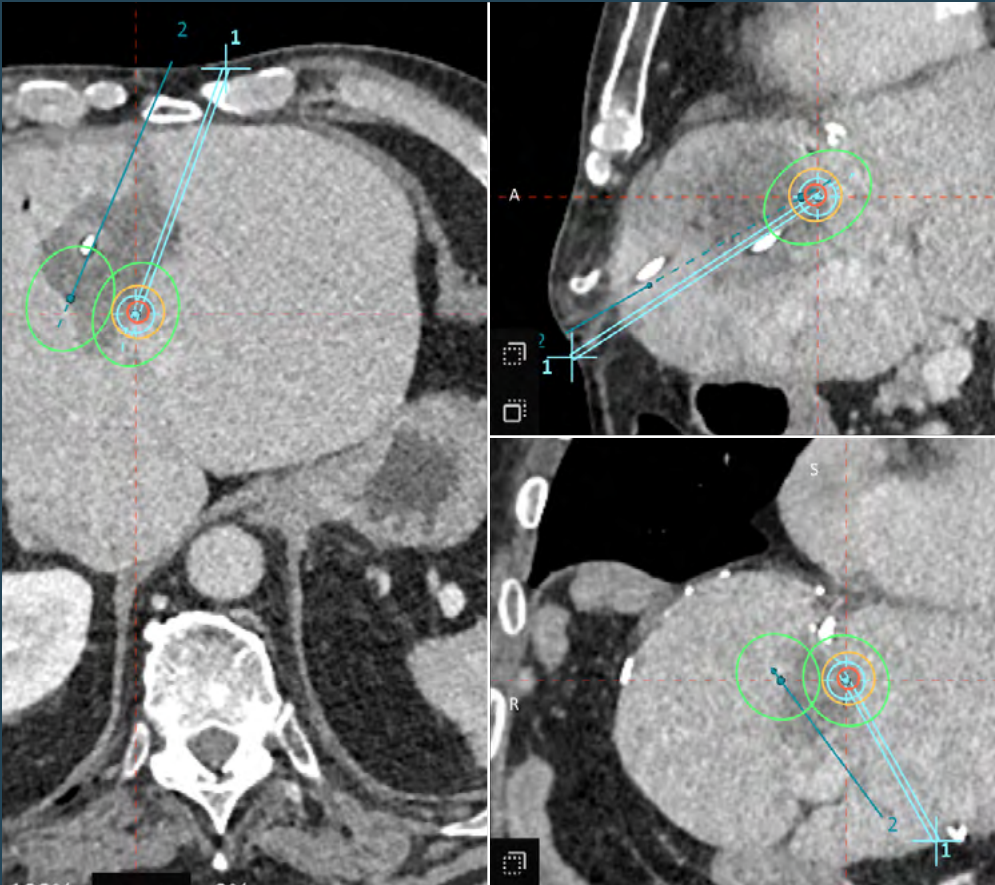
Result

- In the postinterventional control, the lesion was completely covered without evidence of periinterventional complications
- Follow-up by MRI or CT is still pending

Prof. Dr. Wibke Uller and
Dr. Michael Doppler
Universitätsklinikum Freiburg (Germany)



Showing the margin assessment of the ablation zone with Ablasure (with some artifacts due to needles still in place)



Planning of re-ablation to increase the size of the ablation zone and cover the satellite lesion

Stereotactic navigated ablation of two deep metastatic liver lesions

Dr. Shaheen Noorani
Basingstoke and North Hampshire NHS Trust
(United Kingdom)


Liver

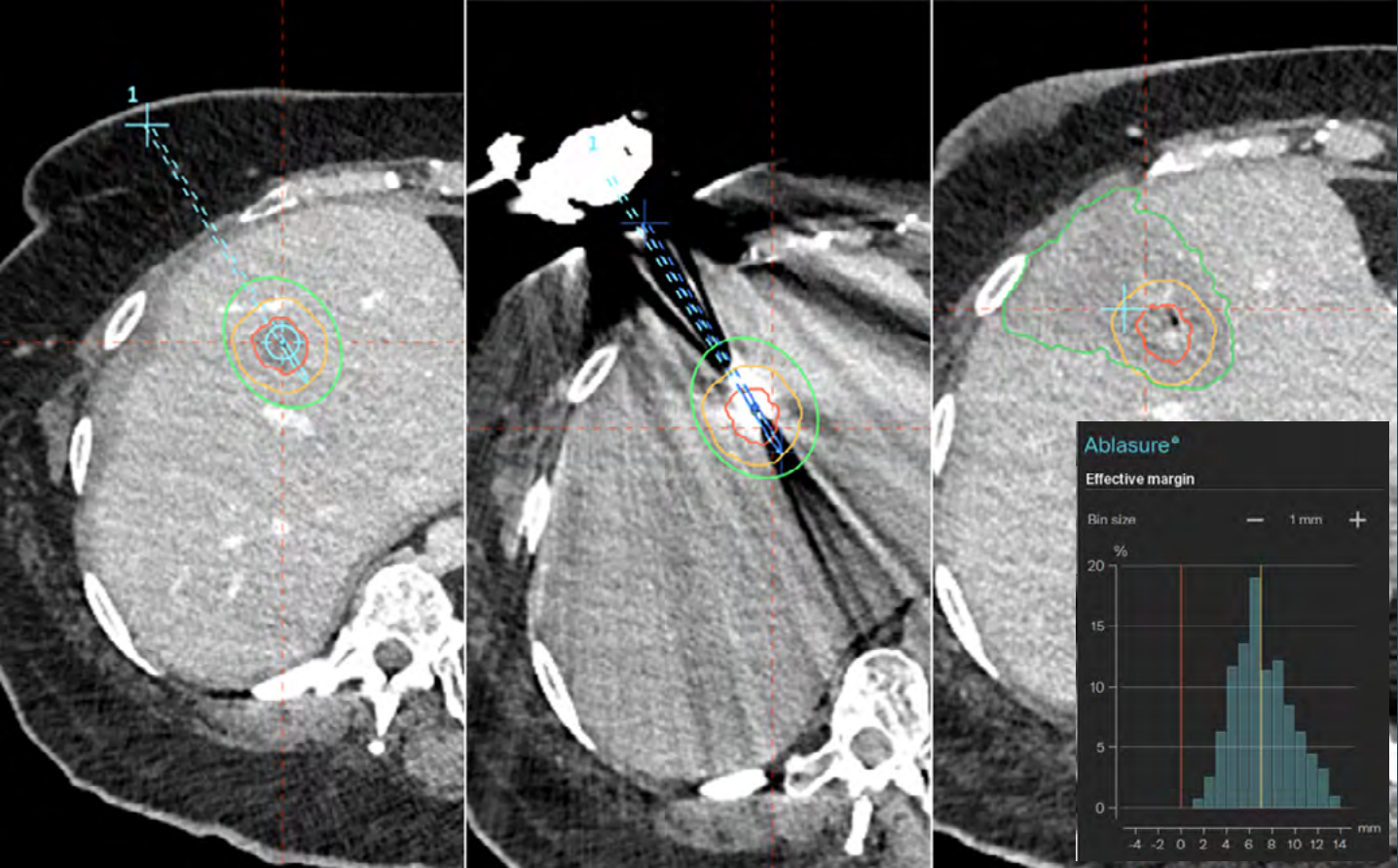

MW


53y



MWA of two deeply situated liver tumours in segments IV and VII. Intraoperative ablation margin control assessed the ablation volume and confirmed need for reablation.

A CT-MRI fusion was performed for the 'invisible' segment VII lesion on CT. Percutaneous MWA was selected as the safer, non-invasive treatment option over surgical resection.

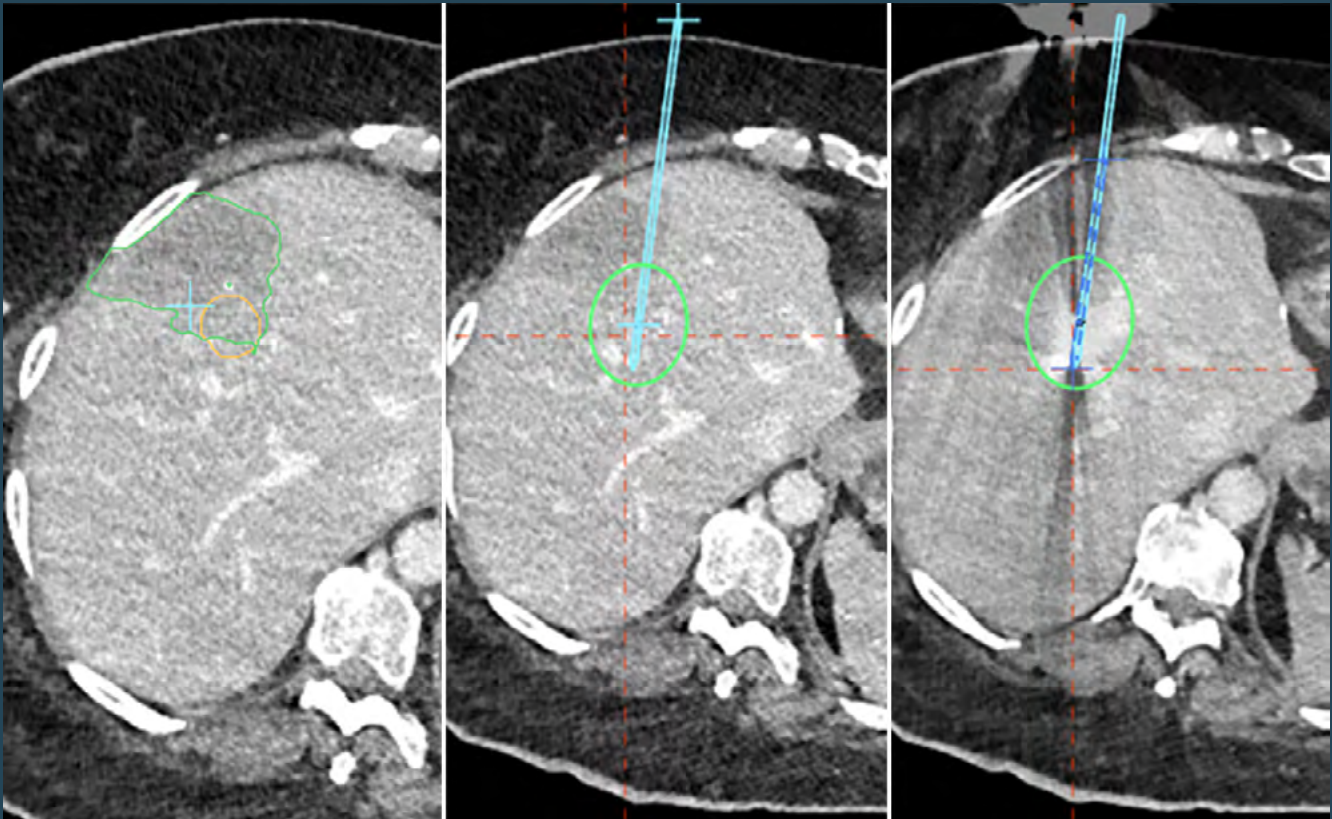


Trajectory plan Needle verification Ablation segmentation and histogram with Ablasure

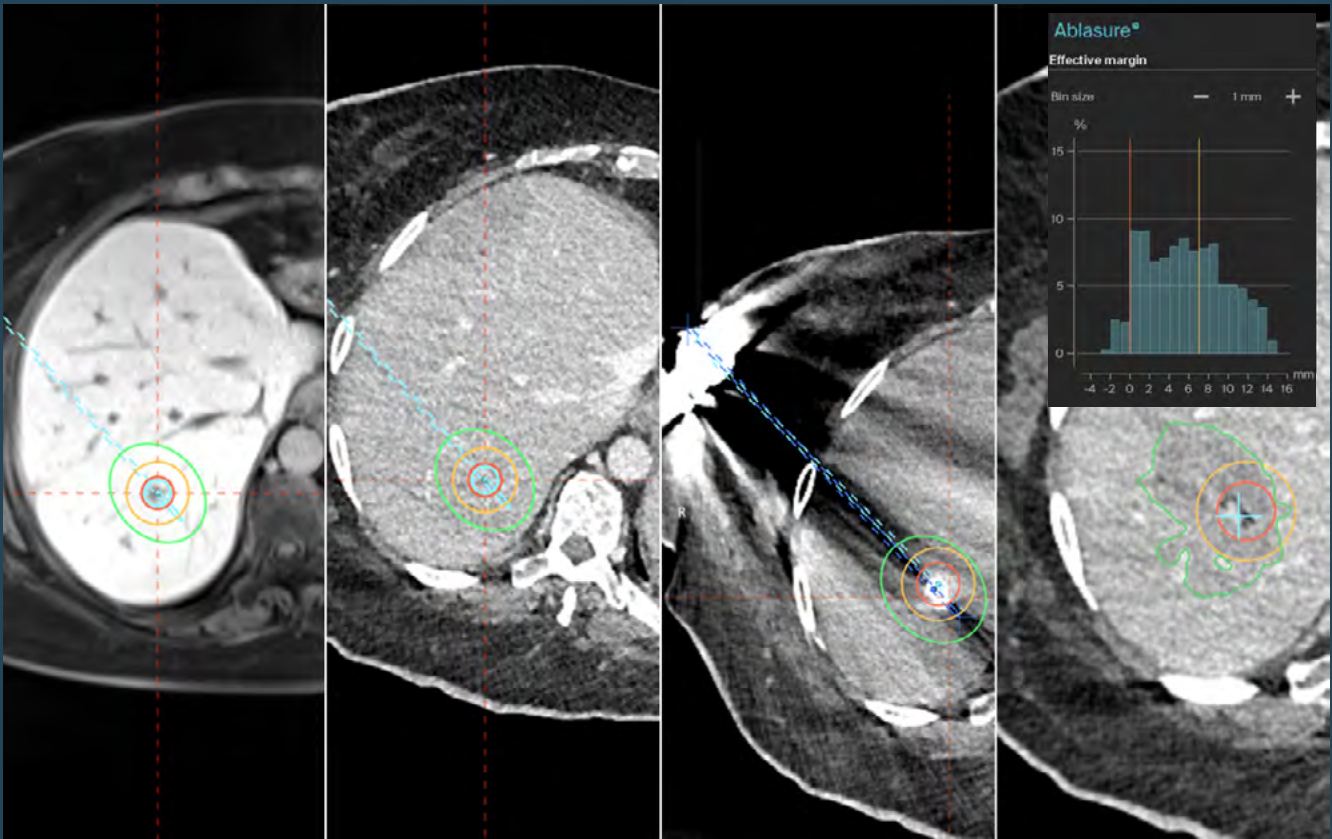
- Initial condition**
- Patient presented with a CRLM in segment VII
 - Lesion was resected resulting in sepsis. Patient recovered in six months.
 - Residual lesion was still in situ and developed further metastasis
 - Patient then underwent chemotherapy, resulting in a good response and evident tumour reduction
 - Ablation of the two deeply situated metastatic lesions (segments VII and IV) and subsequently, liver wedge resection with removal of the remaining lesions was planned

- Treatment**
- General anaesthesia and respiratory motion control enabled using apnea during scanning and needle insertion
 - MWA of the segment IV lesion was planned with CAS-One IR and after navigated needle placement, the 4mm lateral needle displacement was compensated for by increasing the time of ablation to subsequently increase the ablation zone

- Post ablation analysis using Ablasure confirmed a slight under-ablation of the clinical margin, and the decision was made to re-ablate
 - A CT-MRI fusion with CAS-One IR was performed for the invisible lesion in segment VII. Ablasure analysis showed complete ablation of the tumour
- Conclusion**
- Post-ablation assessment allowed for concise analysis of the ablation zone, clearly confirming the need for re-ablation of the segment IV lesion
 - The CT-MRI fusion with CAS-One IR was essential to accurately locate the invisible segment VII lesion
 - Ablation of both lesions was successful, and the patient was discharged the following day



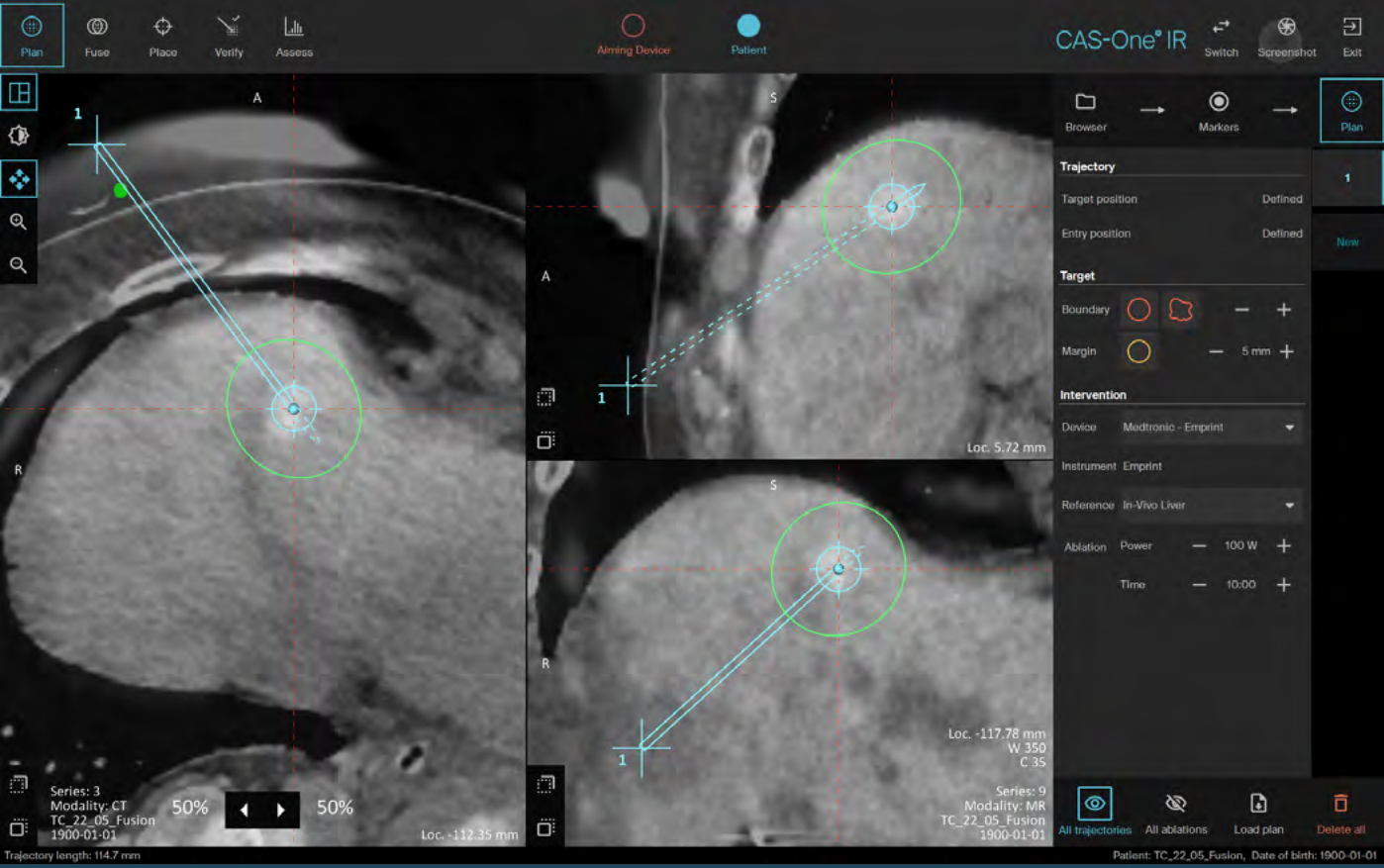
Under-coverage of clinical margin confirmed Re-ablation trajectory plan Re-ablation needle verification



Lesion visible on MRI CT-MRI fusion plan Needle verification Ablation segmentation and histogram with Ablasure

Invisible HCC lesion treated with curative intent

Multi-Modality (MRI-CT) Fusion enabled tissue sparing MWA of a HCC Segment IVa lesion for local-regional treatment with curative intent.



Planning of the MWA fusing CT and MRI.

Initial condition

- December 2019:
 - Two suspected HCC lesions were biopsied and treated with MWA in January 2020
 - Confirmed recurring HCC, stage A (BCLC Staging), liver cirrhosis child-pugh-stage A6, steatohepatitis with portal hypertension
- CT-Guided MWA and biopsy of the lesion in segment VII in June 2020 and another CT-Guided MWA of the lesion in segment VI in September 2020
- January 2022: discovered a new lesion in segment IVa at the border to segment VIII. Diffusion restriction.

Treatment

- February 2022: Fusion of the planning CT with the MRI
- DWI sequence was used to fuse where lesion was only clearly visible
- Intercostal, caudocranial access was chosen
- An angulated trajectory was chosen, with easy insertion and precise needle placement

Conclusion

- Very good coverage of the lesion including safety margin confirmed with Ablasure technology
- Image fusion enabled a tissue-sparing treatment option for this patient
- DWI fusion was the best option for good visibility of the tumour and enabled a fast, effective procedure
- End of May 2022: follow up MRI planned

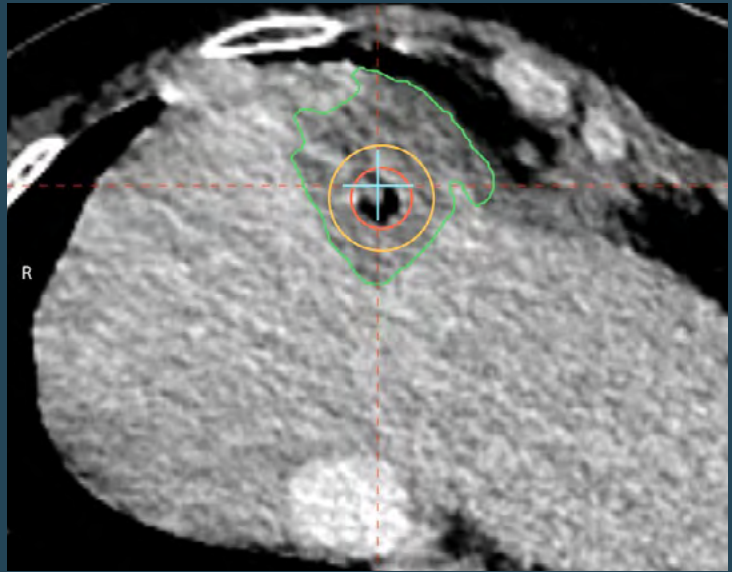
Dr. Nando Mertineit
Bürgerspital, Solothurn (Switzerland)

Video

Liver

MW

78y

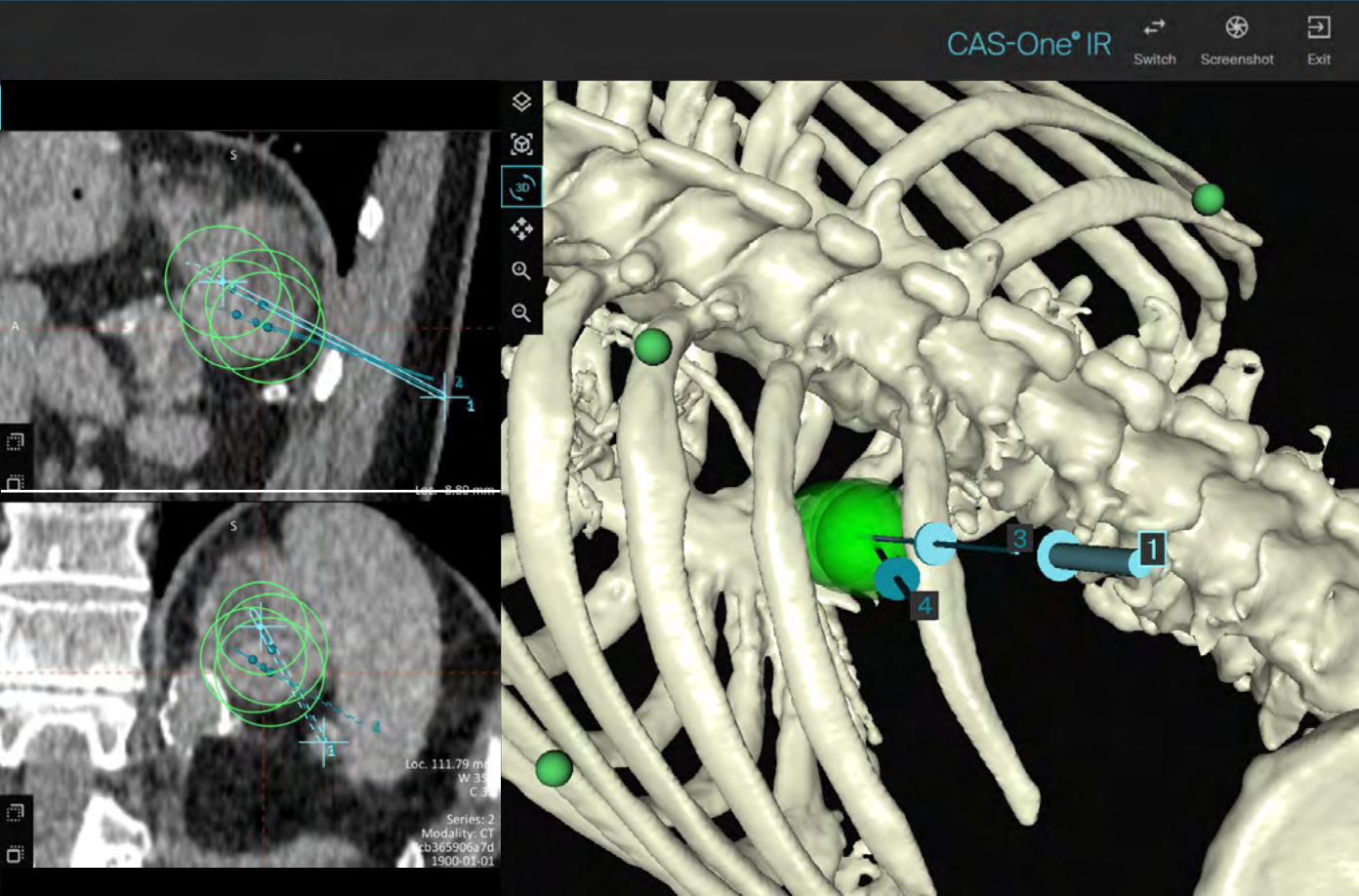


Post-Ablation confirmation of the ablation zone, showcasing complete tumour destruction, including safety margin and histogram using Ablasure.

RCC pull-back microwave ablation with two trajectories and four ablation zones

Complex MWA in an RCC patient previously treated with a surgery. Patient treated with left nephrectomy for renal cell carcinoma in 2004. In 2021 a biopsy confirmed a progressively growing local recurrence. Patient was referred to the IR department.

First, RFA to reduce the size of the lesion was performed, followed four months later by a pull-back MWA with two trajectories and four ablation zones. An immediate re-ablation to ensure all residual mass has been destroyed completed the treatment.



Planning scan showing the two trajectories and four overlapping ablation zones

Initial condition

- Patient was first diagnosed with a clear cell RCC pT1a cN0 cM0 on the left side in 2004
- Open surgery with complete left nephrectomy afterwards
- Biopsy confirmed a progressively growing local recurrence in 2021
- In September 2021 the patient was referred to IR and treated with CAS-One IR guided RFA with the goal of the treatment to reduce the lesion size
- In January 2022 the entire lesion was treated with CAS-One IR guided MWA with a total of 5 (overlapping) ablation zones


Treatment

- Patient in prone position. Intercostal, oblique access was chosen
- 2 trajectories, with a pulled back ablation for a total of 4 ablation zones was planned
- After the post-ablation scan, an additional ablation zone was planned to ensure no residual tumour mass

Result

- CAS-One IR allowed planning of overlapping ablation zones to achieve an ablation volume big enough to cover the atypically shaped tumour
- A potential underablated area was re-ablated immediately in the same session
- 3 month follow-up CT-scan showed slight decrease in volume of the lesion (now liquid state)
- Patient remains under frequent surveillance

Dr. Levent Kara
Stadtspital Zürich Triemli, Zürich (Switzerland)

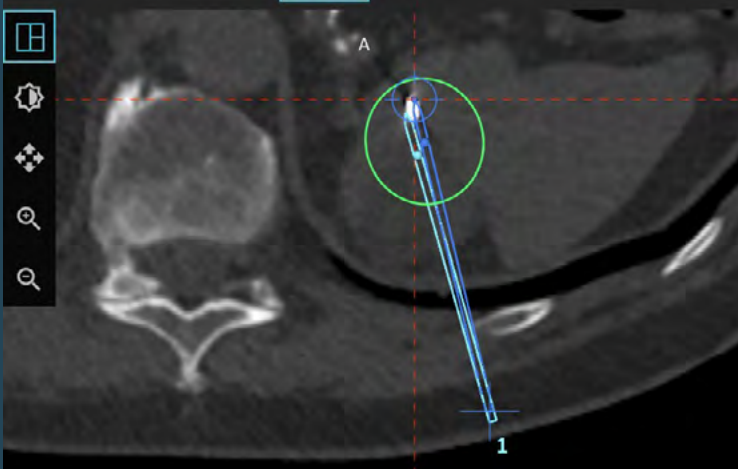
Kidney

MW

77y



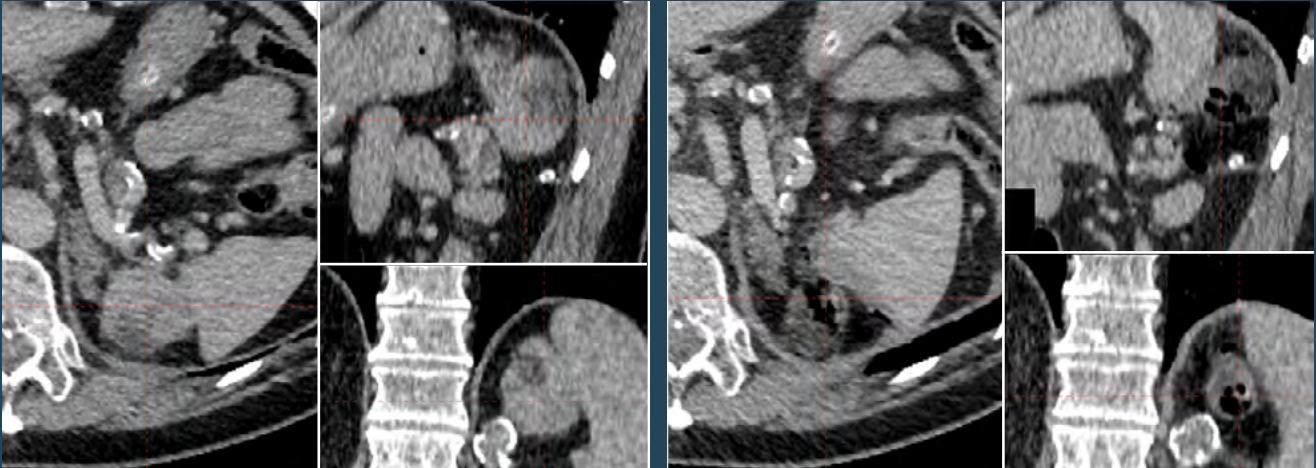
PlanFusePlaceVerifyAssess



Instrument

Tip position	Defined
Entry position	Defined
Displacement	
Lateral	1.6 mm
Depth (too deep)	-3.0 mm
Angular	1.1°

First needle verification scan



Side by side comparison of pre-ablation image on the left and post-ablation image on the right

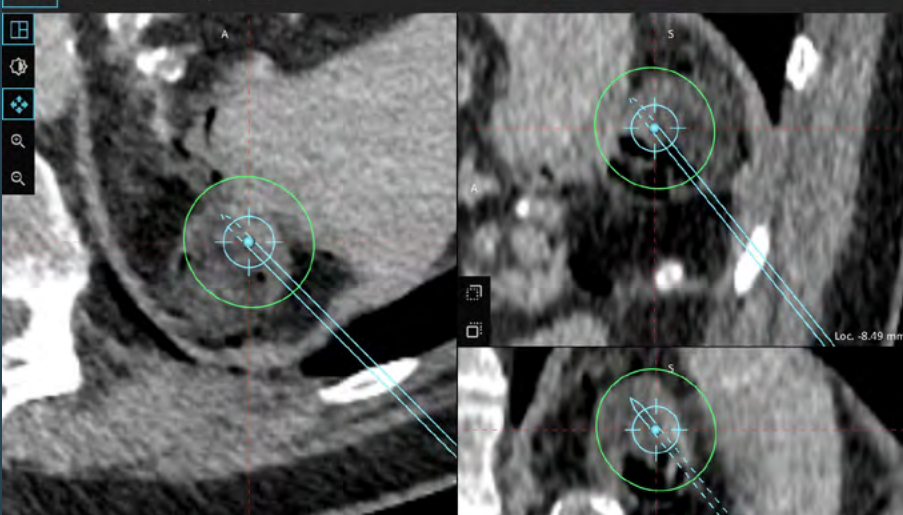
PlanFusePlaceVerifyAssess

Aligning DevicePatient

CAS-One IR

SwitchScreenshotExit

Plan



Trajectory

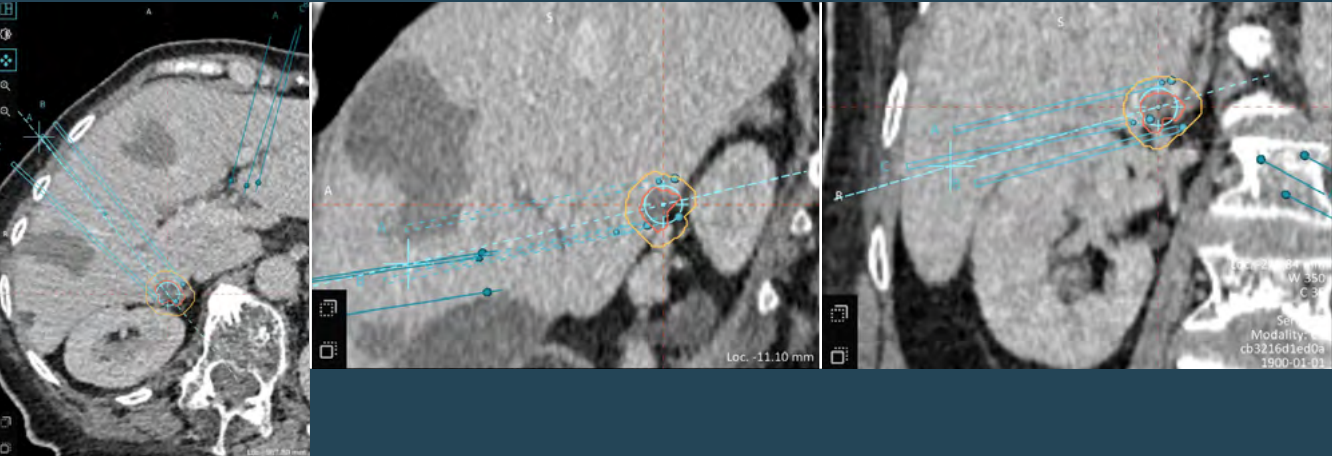
Target position	Defined
Entry position	Defined
Target	
Boundary	— +
Margin	— 5 mm +
Intervention	
Device	Medtronic Enprint
Instrument	Enprint
Reference	In-Vivo Liver
Ablation Power	— 75 W +
Time	— 04:33 +

Planning of re-ablation

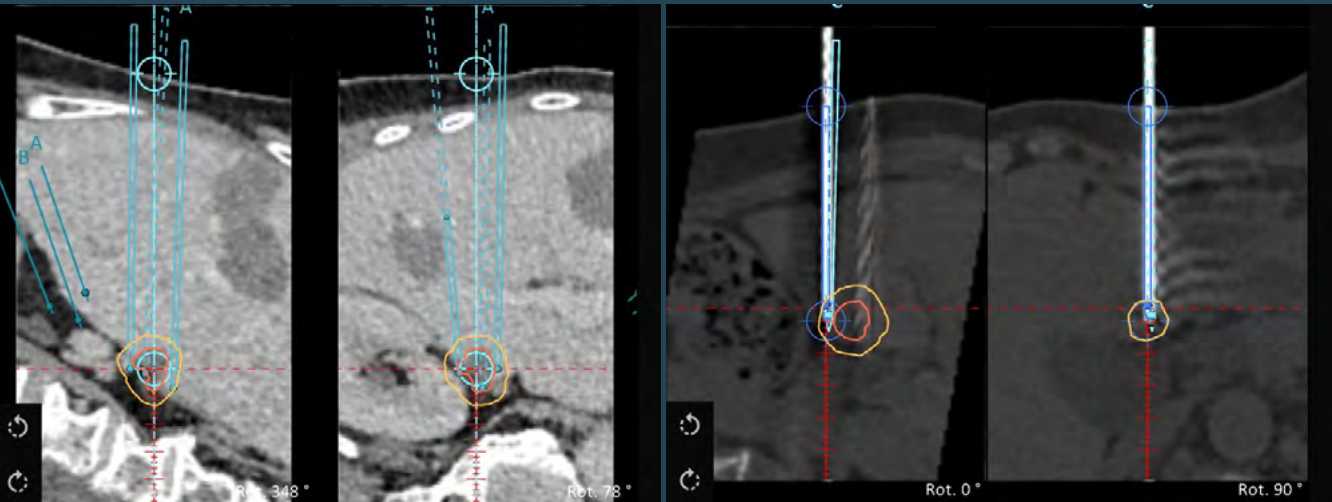
Complex 12 needle combined ECT/MWA of 8 metastatic liver lesions

CAS-One IR allowed for a standardised and efficient treatment of a complex combined ECT/MWA case. The patient was diagnosed with advanced CRLM and had previously undergone freehand ablation treatment with incomplete results. Some lesions were in close proximity to critical structures so accurate needle placement with minimal damage to

surrounding structures was essential. Combining key features such as 3D trajectory planning, navigated needle placement and CT/MRI fusion, the IR was able to successfully treat the patient over two sessions, with a four-month follow-up showing no major side effects or reoccurrence.



Planning ECT needle placement



ECT parallel needle arrangement

Verifying ECT needle position

CASE OF THE YEAR

Dr. Michael Kerezsy
Interventional Radiology Klinikum Passau,
Germany



Liver



MW



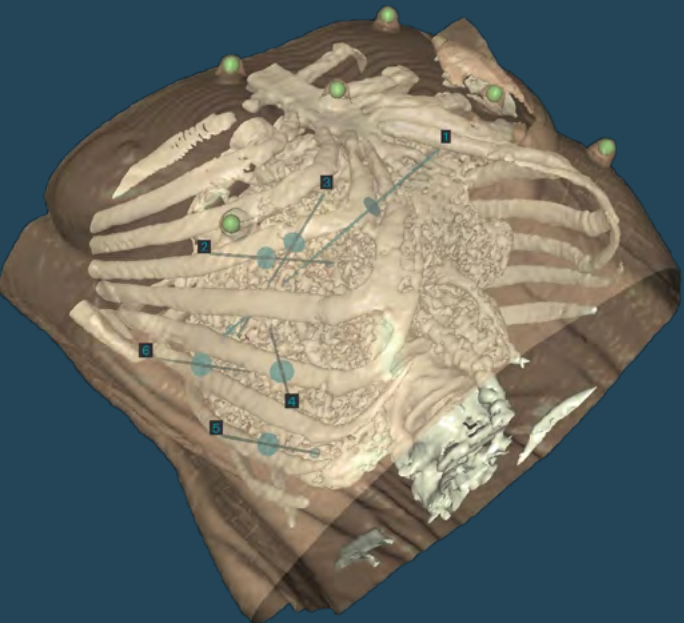
ECT



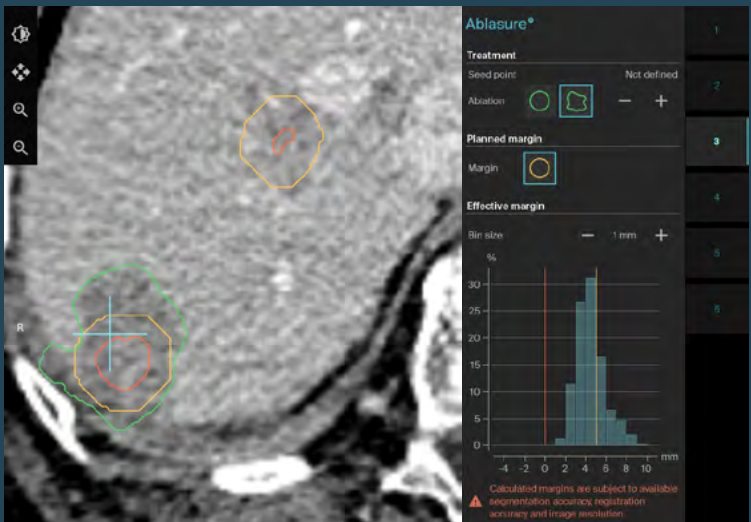
75y



MWA trajectory planning



3D visualisation of all six MWA trajectories



Post-ablation visual and AblaSure assessment of ablation zone

Initial condition

- Patient initially diagnosed with a 5cm rectal cancer lesion and hepatic mets (ten lesions visible) in December 2021. Radio-chemotherapy followed by deep anterior rectal Hartmann's resection in March 2022.
- A liver wedge resection of seg. II was performed.
- Follow-up scan confirmed a new lesion. Systemic therapy with B-Folfox in combination with MWA of the metastatic liver lesions (in accordance with CLOCC study) was prescribed in April 2022.

- In May 2022, freehand MWA of eight remaining liver lesions was performed. Four of the lesions were later re-ablated due to incomplete coverage. Remaining three mets were untreated due to time constraints and complexity.
- Post-ablation follow-up MRI confirmed complete ablation some lesions and incomplete ablation of others.
- Due to the complexity of the case and the need for reliable ablation zone confirmation, it was decided to re-ablate the remaining lesions with CAS-One IR using combined ECT/ MWA

Treatment

The treatment was performed in two sessions:

Session 1: CAS-One IR navigated ECT of two lesions

- Two of the lesions were treated with ECT to reduce irreversible heat damage to neighboring structures. The first lesion was situated next to the choledochal duct in seg. IV, the second close to the adrenal gland in seg. VI.
- ECT was performed first, to prevent significant liver deformation post-treatment, which is more common after MWA ablation.
- Six needles in total were successfully placed.

Session 2: CAS-One IR navigated MWA of six previously incomplete / unablated lesions

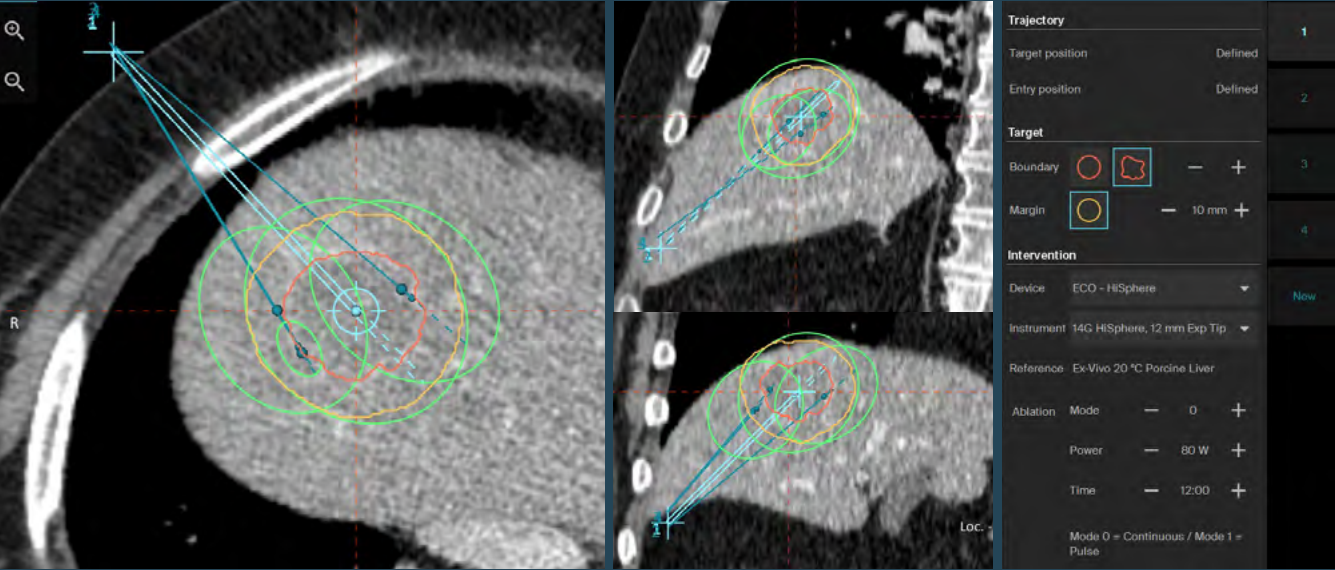
- CT/MRI fusion with CAS-One IR was performed to ensure all residual tumour mass not clearly visible on CT, was targeted.
- Six needles in total were successfully placed.

Conclusion

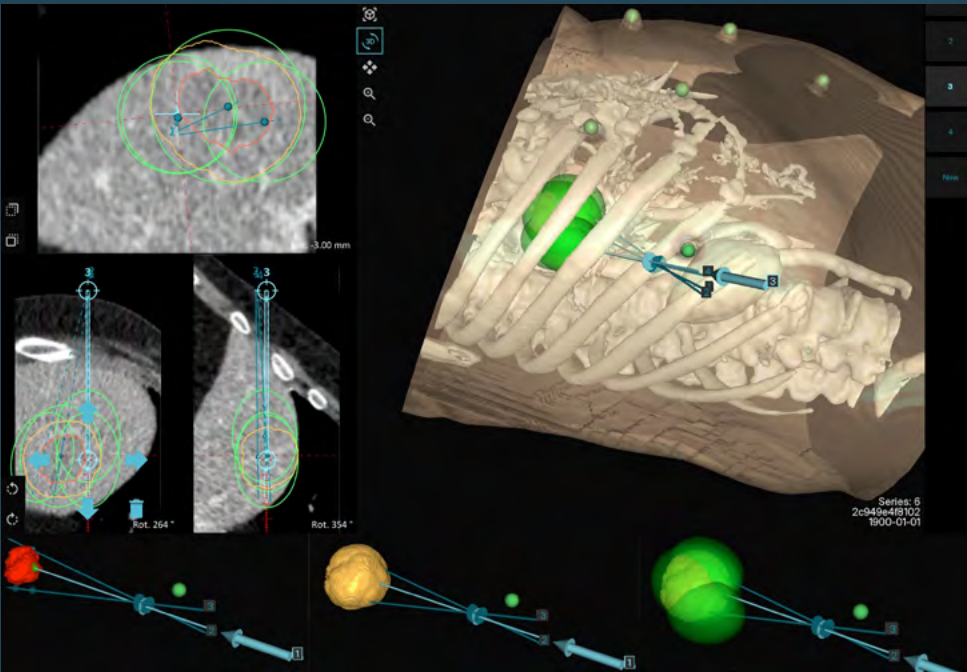
- This was the first case at this hospital and physician with CAS-One IR.
- Median lateral error for needle positions was < 3 mm for all 12 placements.
- Performing parallel ECT probe placements was facilitated using the CAS-One IR after unsuccessful freehand attempts.
- No reoccurrence or major side effects 4-months post-procedure.
- Clinical team is satisfied with the outcome of this complex case.

Multi-volume overlapping ablation zone of a large metastatic liver lesion in segment VIII

Semmelweis University Hospital performed their first CAS-One IR ablation case on a large 41 × 37 mm lung metastasis in the liver. Full ablation zone coverage of all margins was simulated and achieved by planning and placing three trajectories to form four overlapping ablation zones. The needles were accurately placed and the post-ablation analysis confirmed A0 ablation of this large tumour. CAS-One IR streamlined and standardised the CT-guided ablation workflow for this otherwise complex case.



Plan with segmented tumour in red, safety margin in yellow, and the four overlapping ablation zones in green.



3D image reconstruction showing the trajectory view with the segmented tumour in red, 10mm safety margin in yellow and the overlapping ablation zones in green.

Initial condition

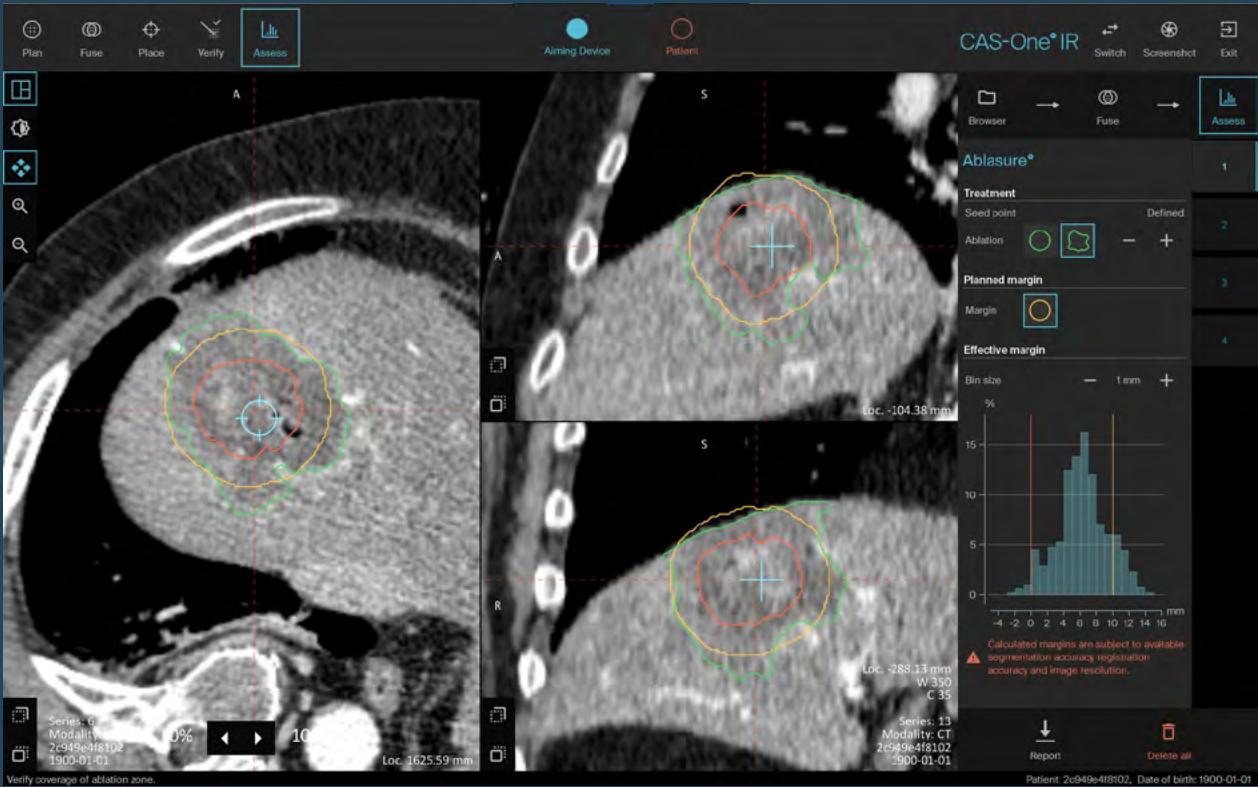
- Patient diagnosed with metastatic lung adenocarcinoma.
- Previous cerebellar metastasis was treated with stereotactic body radiation therapy (Cyberknife).
- Multiple cycles of radio/chemo/immunotherapy.
- A 27 × 30 mm liver lesion was detected in July 2022 on an MRI scan and biopsied. Histological analysis confirmed almost 100% HER2 positivity correlating with lung adenocarcinoma metastasis.

- Patient referred to CAS-One IR ablation for the treatment of this solitary metastatic liver lesion.

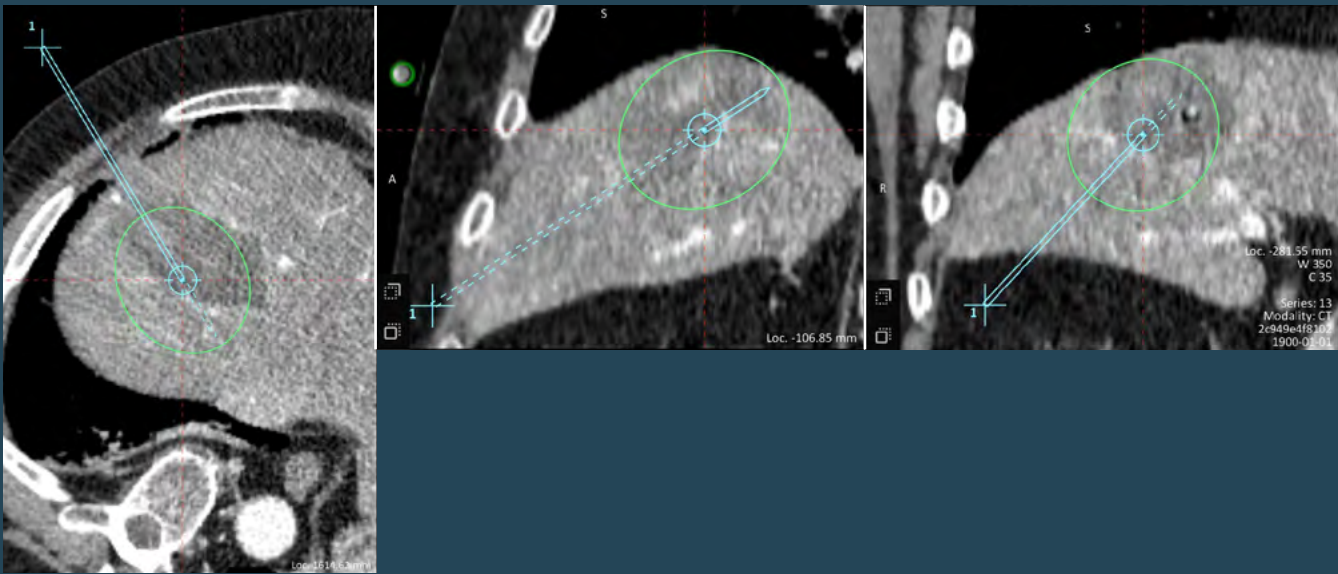
Treatment

- Tumour had grown to 41 × 37 mm.
- Overlapping ablation planned with three trajectories and four ablation zones (pull back ablation planned with one trajectory).

Dr. Pál Ákos Deák MD. PhD.
Semmelweis University, Dept. of Interventional
Oncoradiology, Budapest (Hungary)



Post-ablation image with segmented ablation zone in green.



Re-ablation plan to boost coverage of the caudo-lateral section of the original ablation zone.

- Each needle was navigated to and post-placement analysis confirmed accurate needle advancement.
- Post-ablation scan showed complete ablation of the tumour with a slight under-ablation of the safety margin.
- A new trajectory was re-planned and the patient was re-ablated to achieve full coverage of the safety margin.
- A subcapsular haematoma formed, which was self limiting—confirmed by a later CT scan and followed later with ultrasound.

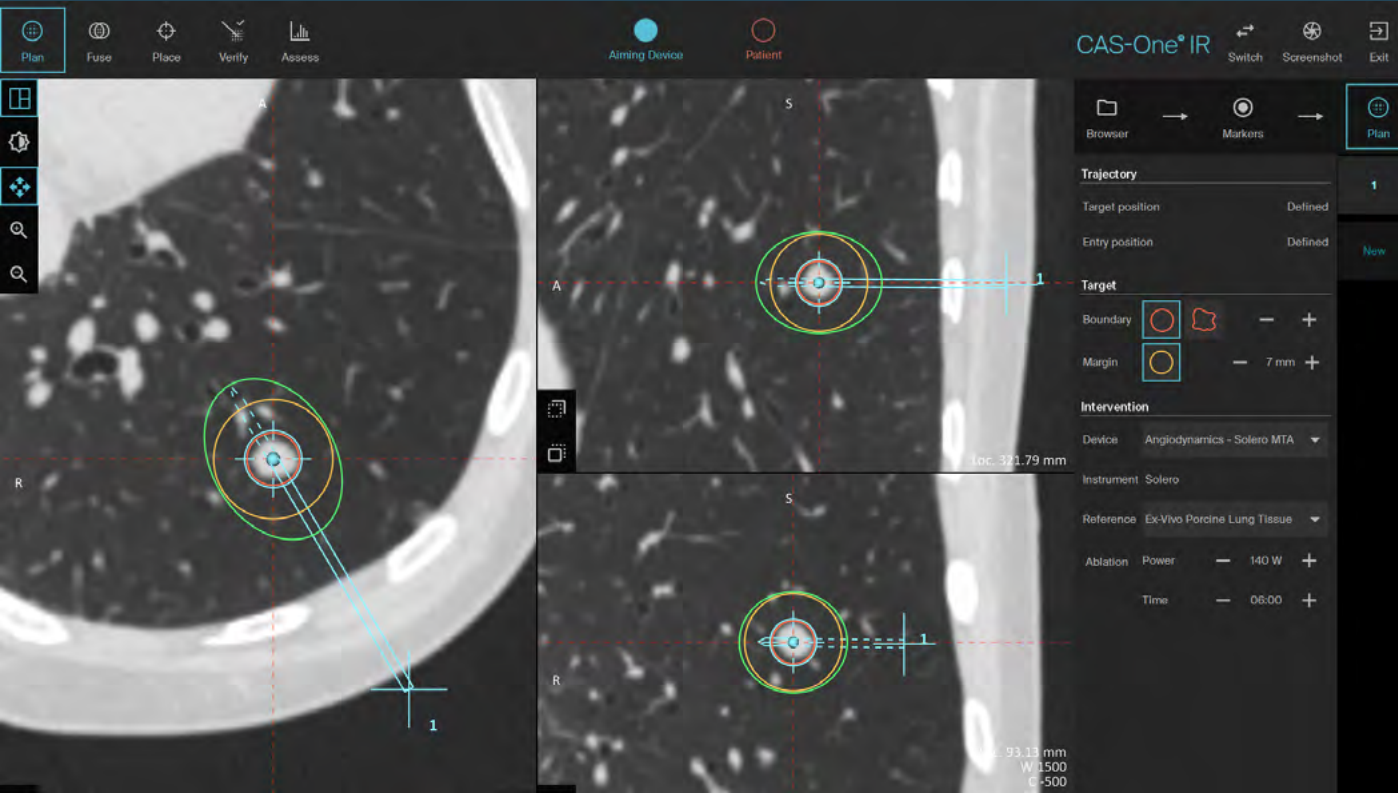
Conclusion

- The planning and simulation of overlapping ablation zones through placing multiple trajectories was simplified and standardised using the CAS-One IR workflow.
- This technique would otherwise have been challenging using the conventional freehand technique, with a high risk of accuracy and efficiency being compromised.
- The operating physician was satisfied with the workflow and treatment outcome, and looks forward to continuing with CAS-One IR cases.

An experienced user's first lung case with CAS-One IR: a standardised workflow with predictable procedure time and reliable outcomes

Following a standardised workflow, a solitary metastatic lung lesion was treated with CAS-One IR guided ablation. A lateral patient position was consistently maintained throughout, providing easy probe access to this posterior lobe lesion. The ablation was efficiently planned and placed deliberately in one entire insertion

depth advancement, with high accuracy. Post-ablation analysis confirmed complete ablation of the tumour. The procedure was done in less than one hour. The success of this users first CAS-One IR lung ablation is a confirmation of the adaptability of this workflow that consistently produces accurate and successful results in multiple organs.



Single needle trajectory plan in MPR and 3D reconstruction views.

Initial condition

- Patient presented with a CRLM in seg. VII
- Initially diagnosed with metastatic colorectal cancer. Preoperative chemo prescribed with Folfox/ Bevacizumab, followed by liver resection in 2020.
- Completed three months of post-operative 5FU chemo.
- Multiple bilateral lung nodules seen on follow-up scan – PET positive.
- MDT decided to resect right upper lobe lung nodule and ablate left lower lobe lung nodule.
- Patient underwent right VATS lobectomy in August 2022, showing metastatic colorectal adenocarcinoma.
- CT scan demonstrated increased size of left lower lobe lung nodule from 5 to 9mm.
- Navigated ablation to be performed using CAS-One IR.

Treatment

- Patient was positioned laterally (fixated using CASCINATION vacuum cushion), with left side up and feet to gantry – in order to better access the posteriorly positioned lesion.
- Trajectory and ablation zone was planned on the initial scan to provide coverage of the tumour and clinical margin.
- Navigation and placement of the probe resulted in accurate positioning with the just one deliberate advancement to the full depth.
- Post-ablation analysis confirmed a successful and complete ablation.
- Pneumothorax from lung puncture with needle was observed on CT and treated immediately after ablation confirmation.

Dr. Shaheen Noorani

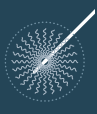
Basingstoke and North Hampshire Hospital
(United Kingdom)



Video



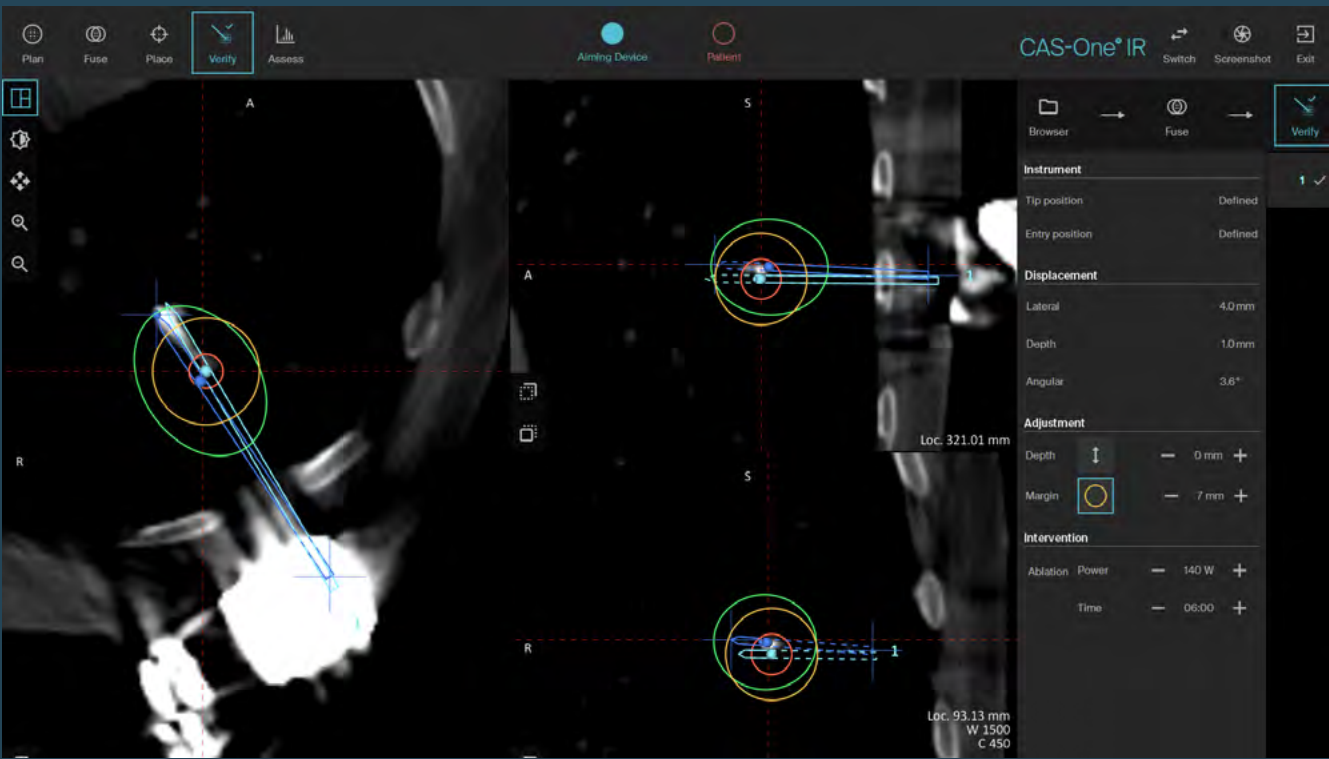
Lung



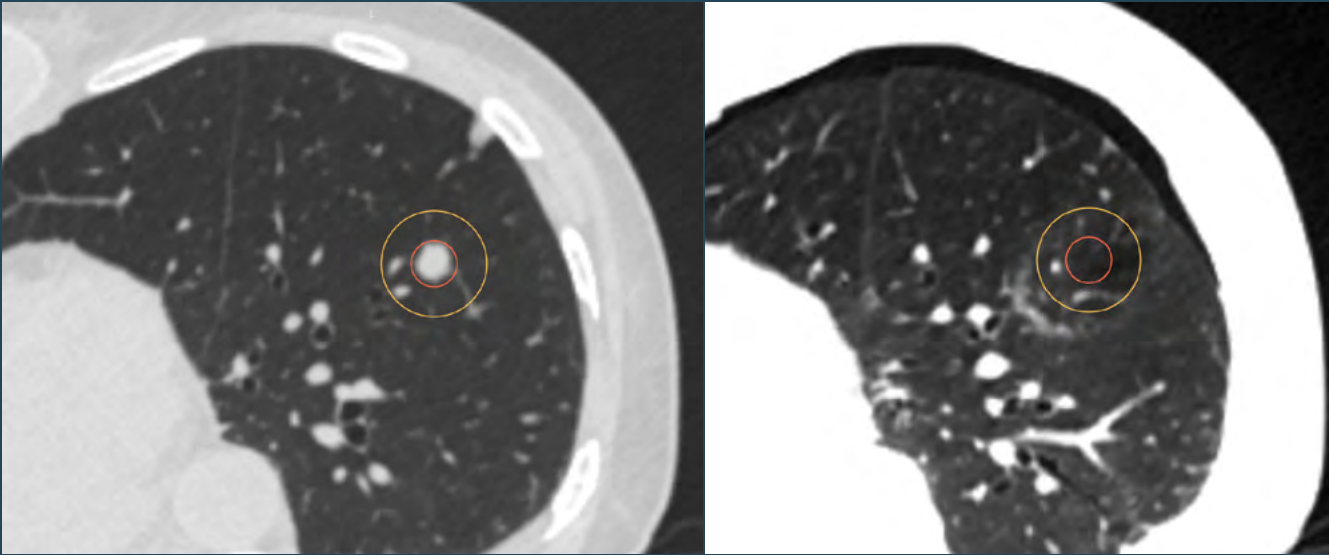
MW



61y



Needle verification showing planned needle position (light blue) vs actual needle position (dark blue).



Planning scan vs post ablation scan – ablation was a technical success.

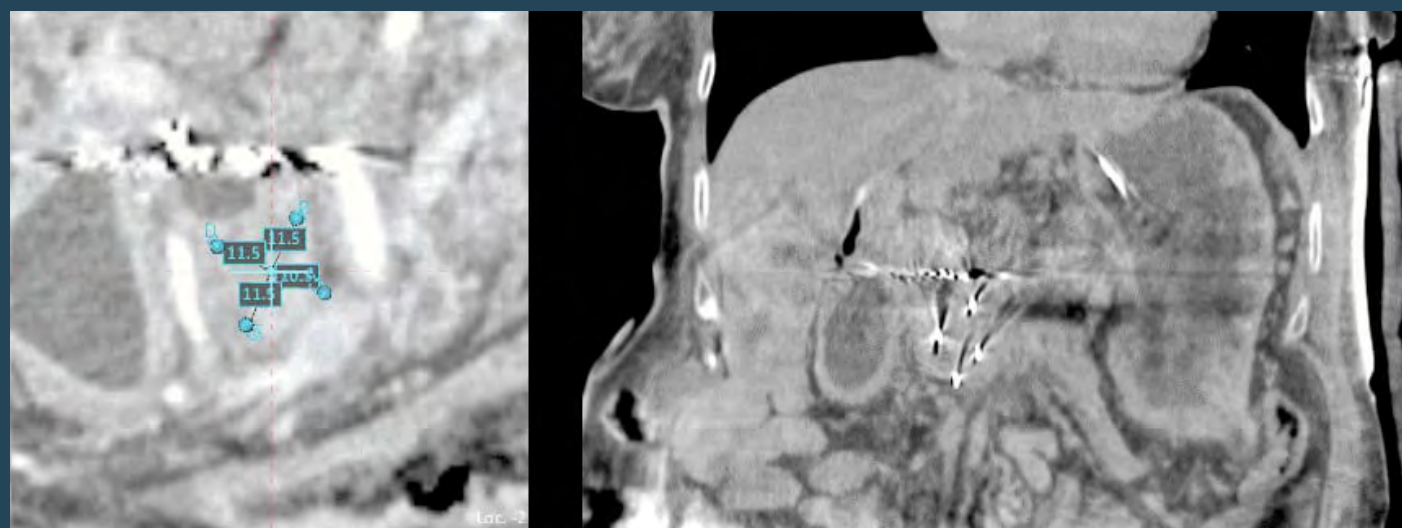
Conclusion

- Patient was successfully treated in just under an hour.
- Physician was happy with the overall result of this first CAS-One IR guided lung ablation.
- CAS-One IR can provide the user with the same level of consistency, accuracy and success across all supported organs.

Trans-hepatic approach to a pancreas head carcinoma with IRE

One of the most complex CAS-One IR cases to date—a trans-hepatic approach to a pancreas head tumour treated with irreversible electroporation (IRE). This 67 year-old female with a 41 mm. lesion in the pancreas head, was not willing to undergo another resection and was treated with this minimally invasive approach.

The planning capabilities of CAS-One IR were critical as the four needles had to be placed in close proximity to two main arteries and the mesenterico-portal vein, and as parallel as possible. The case was quick (< 3 hours) and successful as the post-procedure MRI showed complete destruction of the tumour.



Left: Needle eye view of the planning in between the SMA, an additional right hepatic artery originating from the SMA and the SMV and portal vein. Right: highly accurate needle positioning after placement.

Initial condition

- The patient was diagnosed with Morbus Crohn and underwent several abdominal procedures over time:
 - Abdominal Hysterectomy
 - Angioplasty of coronaries
 - Cholecystectomy, with a complication resulting in a hepatic-enterostomy
 - Surgical repair (abdominal hernia), complicated by an intestinal perforation
- At the beginning of 2022, a locally advanced pancreas-head carcinoma was diagnosed with a diameter of 41 mm and encasement of the Arteria Mesenterica Superior (posterior side) – T4NOMO
- Part of the treatment was with neoadjuvant chemotherapy – 4x Folfirinox with partial response.
- After completing neo-adjuvant chemotherapy patient developed severe malnutrition with need for total parenteral nutrition and was admitted several times for respiratory failure

- The patient refused Whipple surgery, further chemotherapy or radiation.
- IRE with the guidance of CAS-One IR was proposed as treatment modality and approved by the patient
- A gastric outlet syndrome developed just before the planned treatment and was treated after the IRE with a LAMS (Lumen-apposing metal stent) gastrojejunostomia

Treatment

- CAS-One IR enabled the physicians to plan and simulation options, as the lesion needed to be planned between the SMA, an additional right hepatic artery originating from the SMA, the SMV and portal vein – see planning images. Additionally, highly accurate and parallel needle placement was critical.
- The treatment took less than three hours and the patient had no post-procedure complications

Prof. Dr. Thiery Chapelle &
Dr. Bart Op de Beeck

Antwerp University Hospital, Antwerp, Belgium



Video



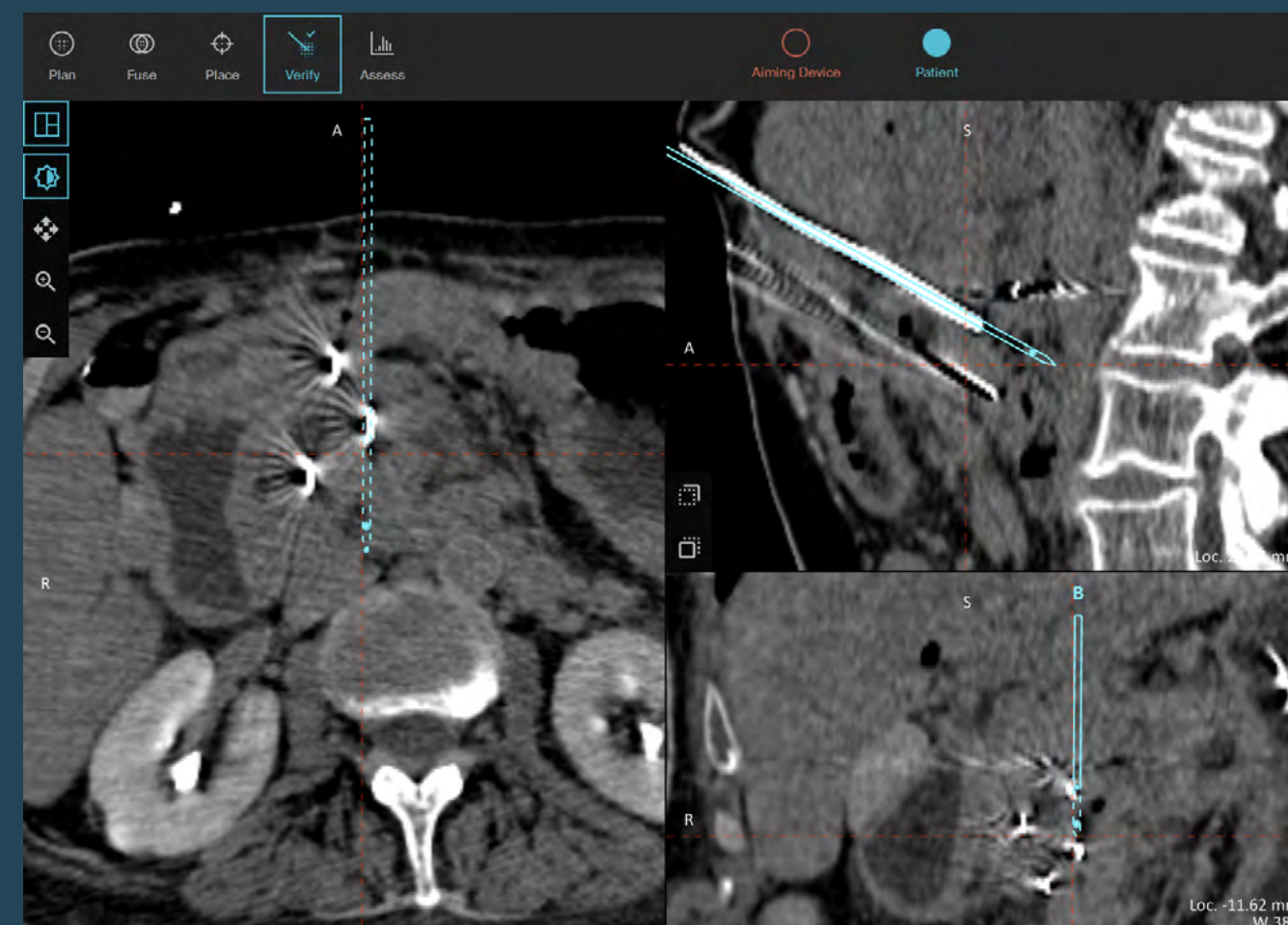
Pancreas



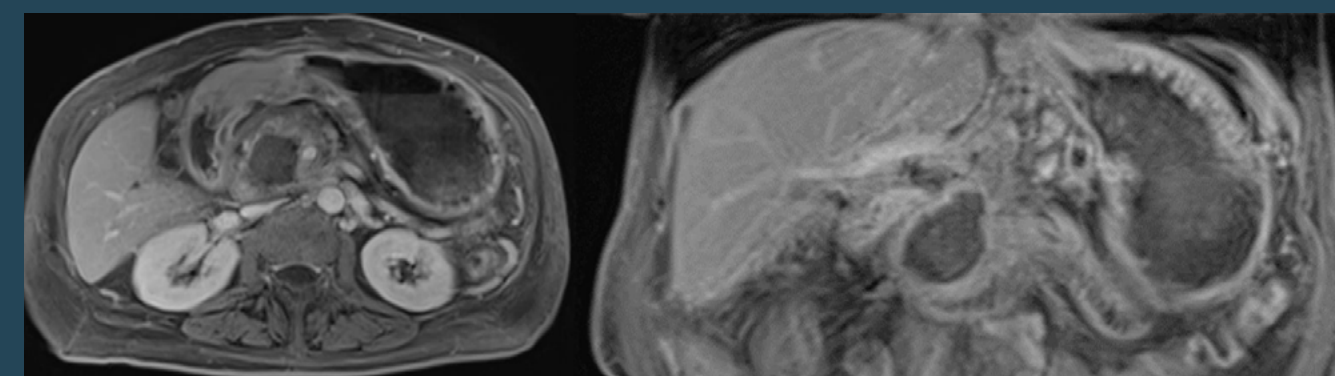
IRE



67y



Needle confirmation with all four needles accurately placed, paralleled, and spaced



Three day post-IRE MRI images showcasing the destruction of the lesion

Conclusion

- The three-day post-procedure MRI showcases a quasi-complete devascularization of the lesion with no restriction on the biliary tract or peripheral pancreatic vessels. No additional satellite lesions were seen.
- A three-month post-procedure CT shows necrotic tissue on the place of the lesion and that it shrunk due to the treatment

- The patient is doing as well as possible
- Radical surgery was not feasible, yet Quality Ablation with CAS-One IR made a local treatment possible. This less invasive approach facilitates a speedy recovery without complications, and offers the patient a better quality of life.

Clinical evidence

Publications and cases

Since its launch in 2013 an increasing body of evidence supports percutaneous tumour treatment with CAS-One IR.

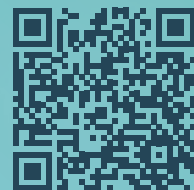
A comprehensive list of publications can be found online.

Monthly selected “Top Cases” feature challenging cases and how CAS-One IR made a difference.

Read our publications



Read our Top Cases Blog



Thanks to all of the physicians
for their ongoing commitment
to generating exciting evidence
for CAS-One IR

Coming Soon

CAS-One[®] IR 4.1

Driven by AI

- Enhanced ablation verification with an improved Ablasure[®] algorithm
- Vivid 3D and MPR intraoperative organ segmentation
- Freestyle mode for high level planning
- Preset organ workflows and data insights

Visualize and confidently treat
from planning through Ablasure
quantitative margin assessment

