Utilizing SGRT in the treatment of oligometastatic hypopharyngeal cancer: case study of a complete remission

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Department of Radiation Oncology Holycross Cancer Center

- Founded in 1997
- Linear accelerators: 4 Elekta Versa HD, 1 Accuray RadixAct tomotherapy
- 2 AlignRT-equipped linacs; 2 more on the way
- First installation of simRT system in Poland
- 2 CT simulators (Somatom Sensation Open, Somatom go.Open Pro)
- More than 2000 yearly patients
- Average of 150 daily patients

Utilization of AlignRT in the Department

- First patient treated in July 2021
- Left breast cancer with DIBH
- Patient positioning
- SBRT in lung, pancreas, adrenal and liver tumors (with DIBH)
- SBRT of other locations – intrafraction control

Case overview

- A 45-years-old woman with history of follicular thyroid cancer, treated with thyroidectomy and iodine therapy **in 2005**
- Reports in 2021 with a suspicious 2 cm mass in the left submandibular region, noticed by the patient 4 weeks prior
- H/P of the lymph node reveals a metastasis of a squamous cell cancer (unknown primary)
- Further testing reveals the primary tumor in the left piriform sinus and multiple metastases to the cervical lymph nodes, as well as a **single metastasis to the liver** (22 x 16 mm)

Case overview

- Additional examination revealed metastatic lesions in the **sacral bone** and in the **3rd left rib**
- Disease staged as **cT1N2cM1** (clinical stage IVC) *at initial presentation*
- Neoadjuvant chemotherapy (3 courses of cisplatin + 5-fluorouracil) was started due to dissemination of the disease, with planned radicalization – chemoradiotherapy.
- The decision to introduce SBRT of metastatic lesions sequentially with neoadjuvant chemotherapy was made by the multidisciplinary team and discussed with the patient

A "personalized" approach was taken due to oligometastatic disease, patient's age and clinical state, and few comorbidities

Workflow

1. Qualification of the patient for treatment
2. Initial interview, breathing exercises, making a mask/mould
3. CT simulation, choice of immobilization device
4. Contouring
5. Treatment planning
6. Radiation treatment
7. Follow-up

NCCN Guidelines Version 1.2024
Very Advanced Head and Neck Cancer

NCCN Guidelines Index
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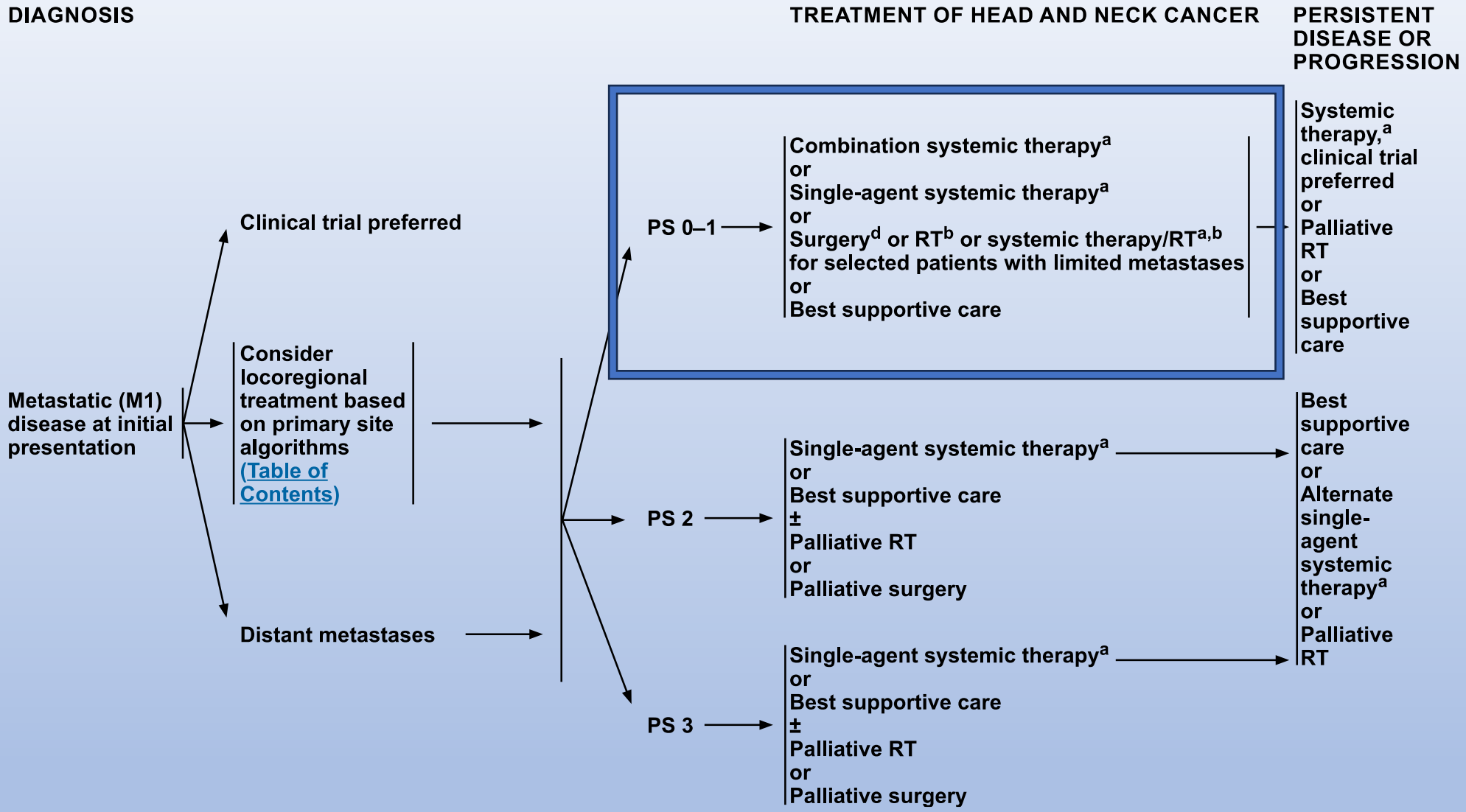
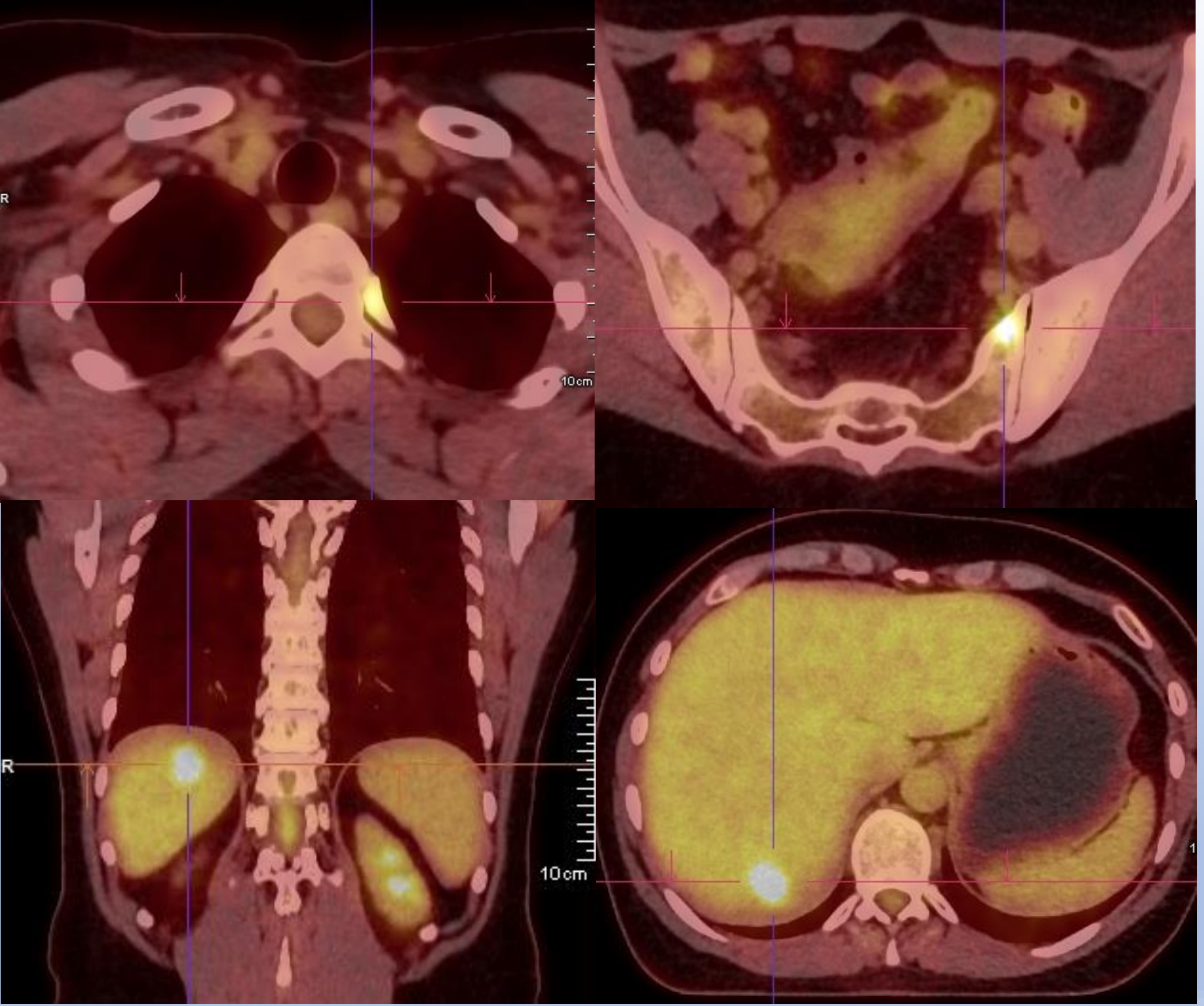
Discussion



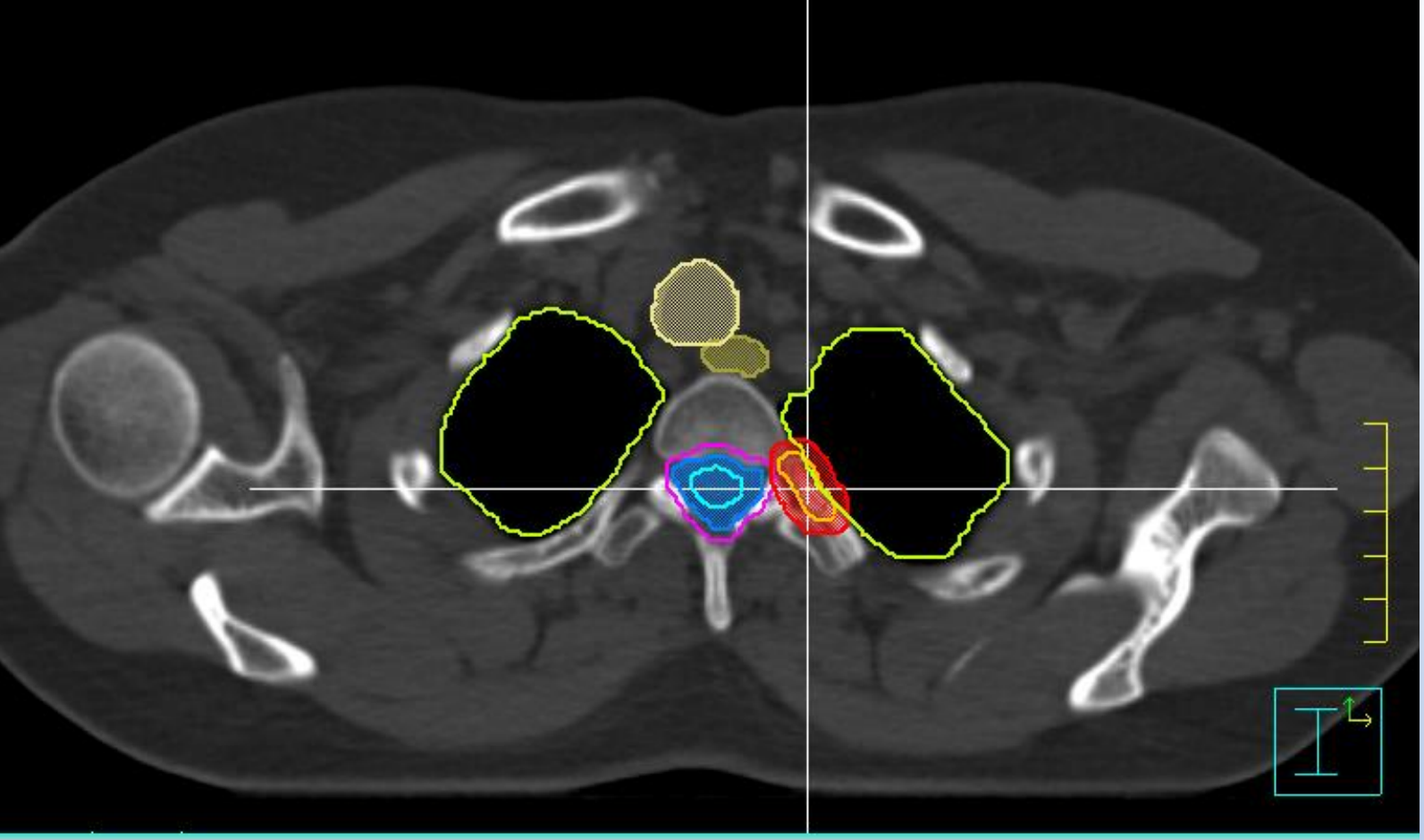


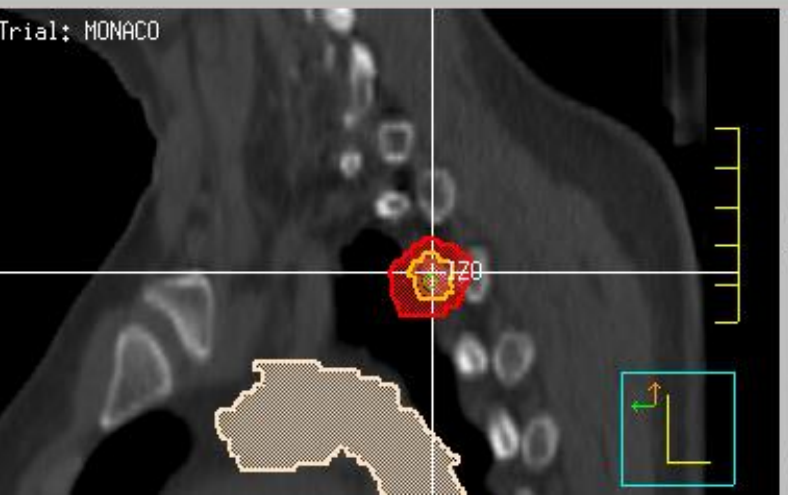
PET scans

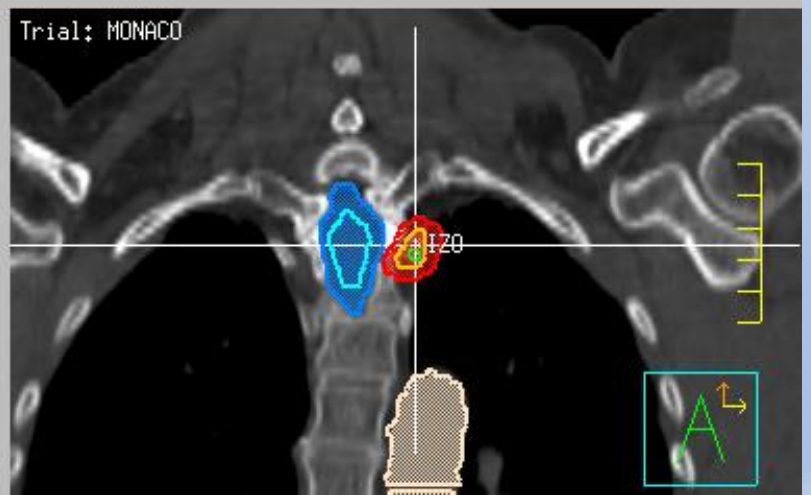
Metastatic lesions in the 3rd left rib, left side of the sacral bone and the liver

Personalized approach

- After the 3rd course of neoadjuvant chemotherapy, the patient was admitted to the Department of Radiation Oncology for SBRT of the metastatic lesions localized in:
  (1) 3rd left rib
  (2) sacral bone
  (3) liver.
- All plans were prepared using CT imaging fused with PET scans and MR images for the liver SBRT

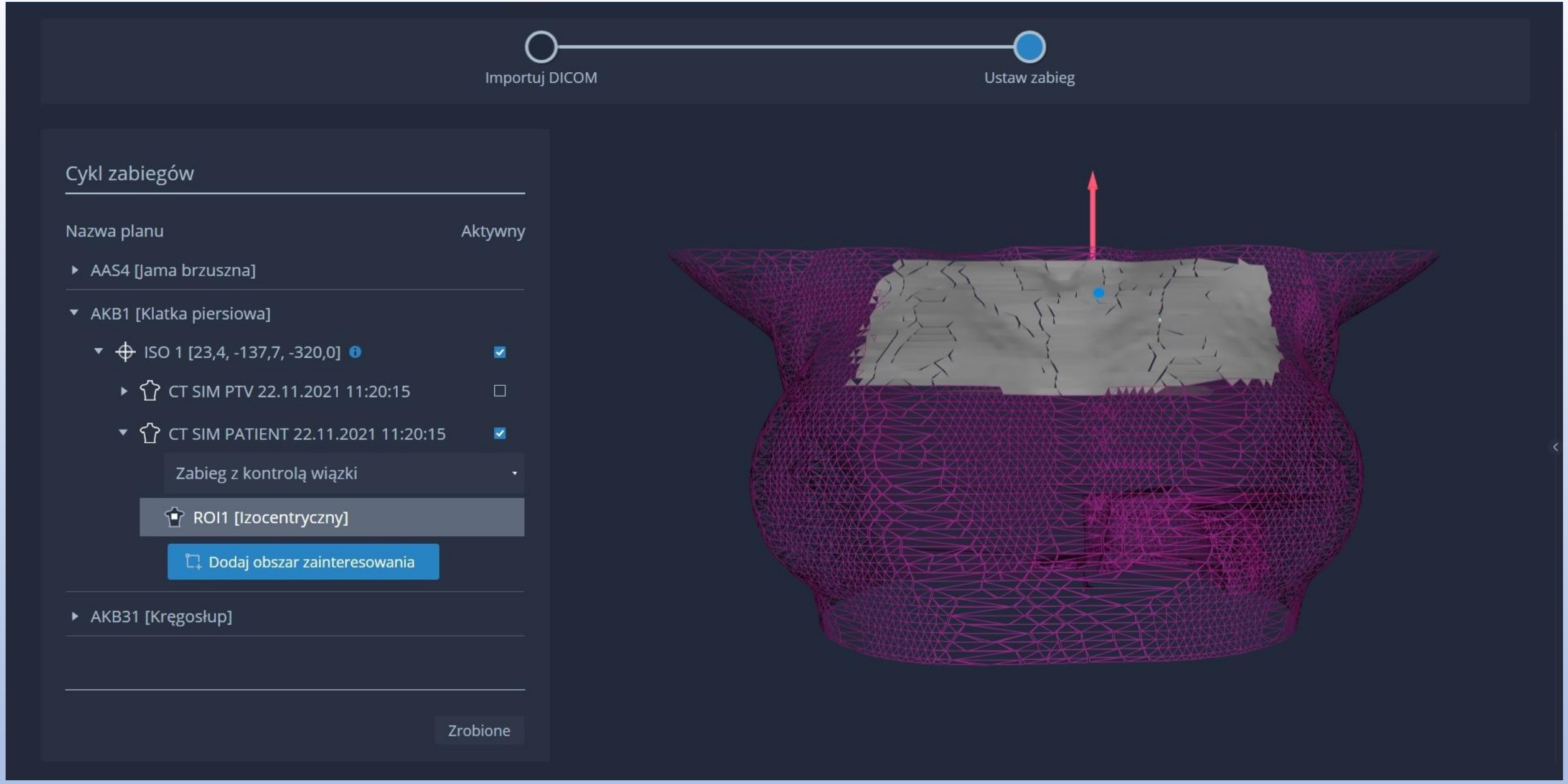






3rd left rib SBRT

50 Gy in 5 fractions, VMAT with 6 MV FFF photons used for dose delivery; 6D robotic couch; AlignRT used for positioning and intrafraction control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AKB31 [Kręgosłup]
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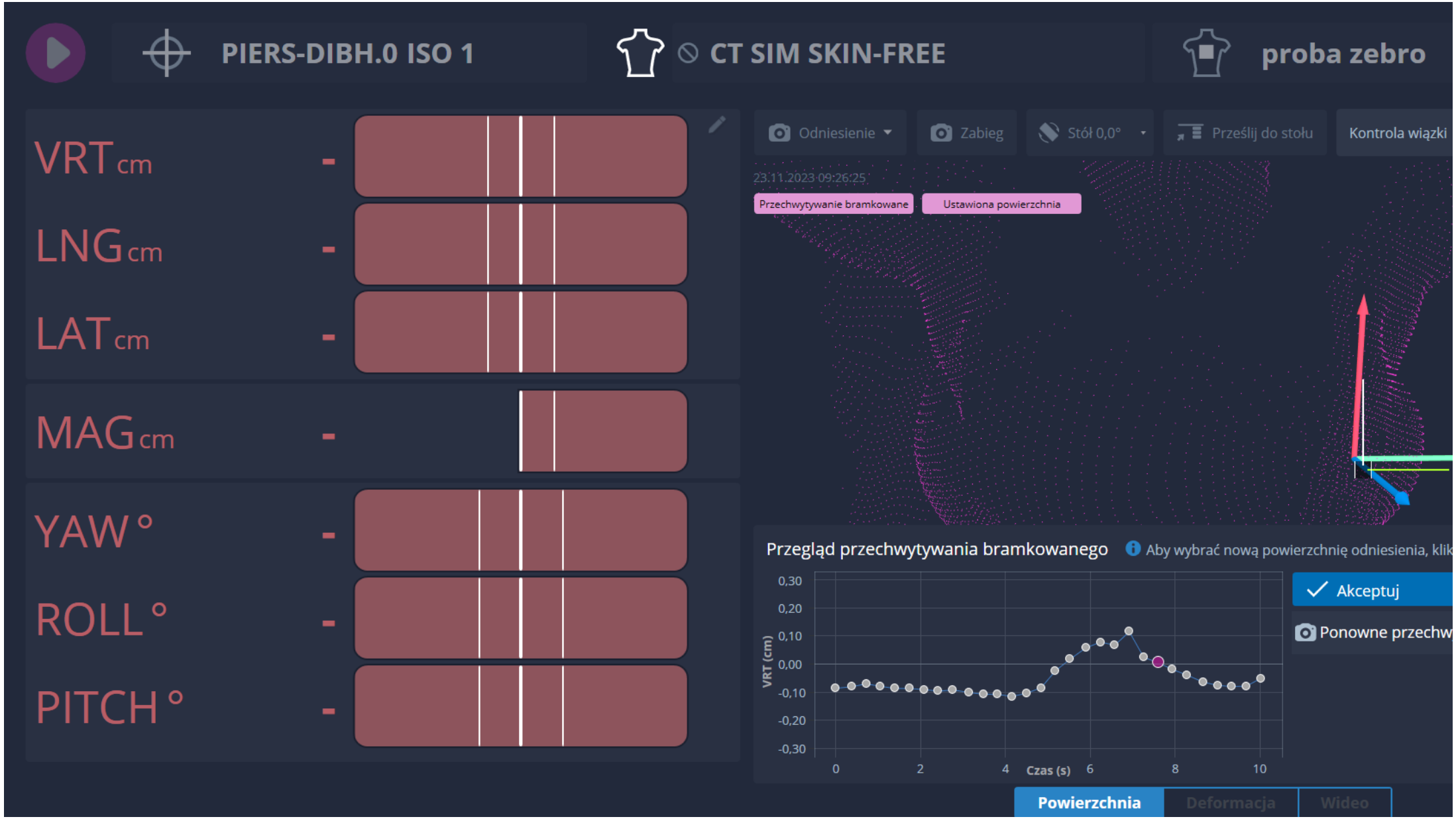
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VRT cm
LNG cm
LAT cm
MAG cm
YAW °
ROLL °
PITCH °
Odniesienie
Zabieg
Stół 0,0°
Prześlij do stołu
Kontrola wiązki
23.11.2023 09:26:25
Przechwytywanie bramkowane
Ustawiona powierzchnia
Przegląd przechwytywania bramkowanego
Aby wybrać nową powierzchnię odniesienia, klik
0,30
0,20
0,10
0,00
-0,10
-0,20
-0,30
VRT (cm)
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2
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Czas (s)
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8
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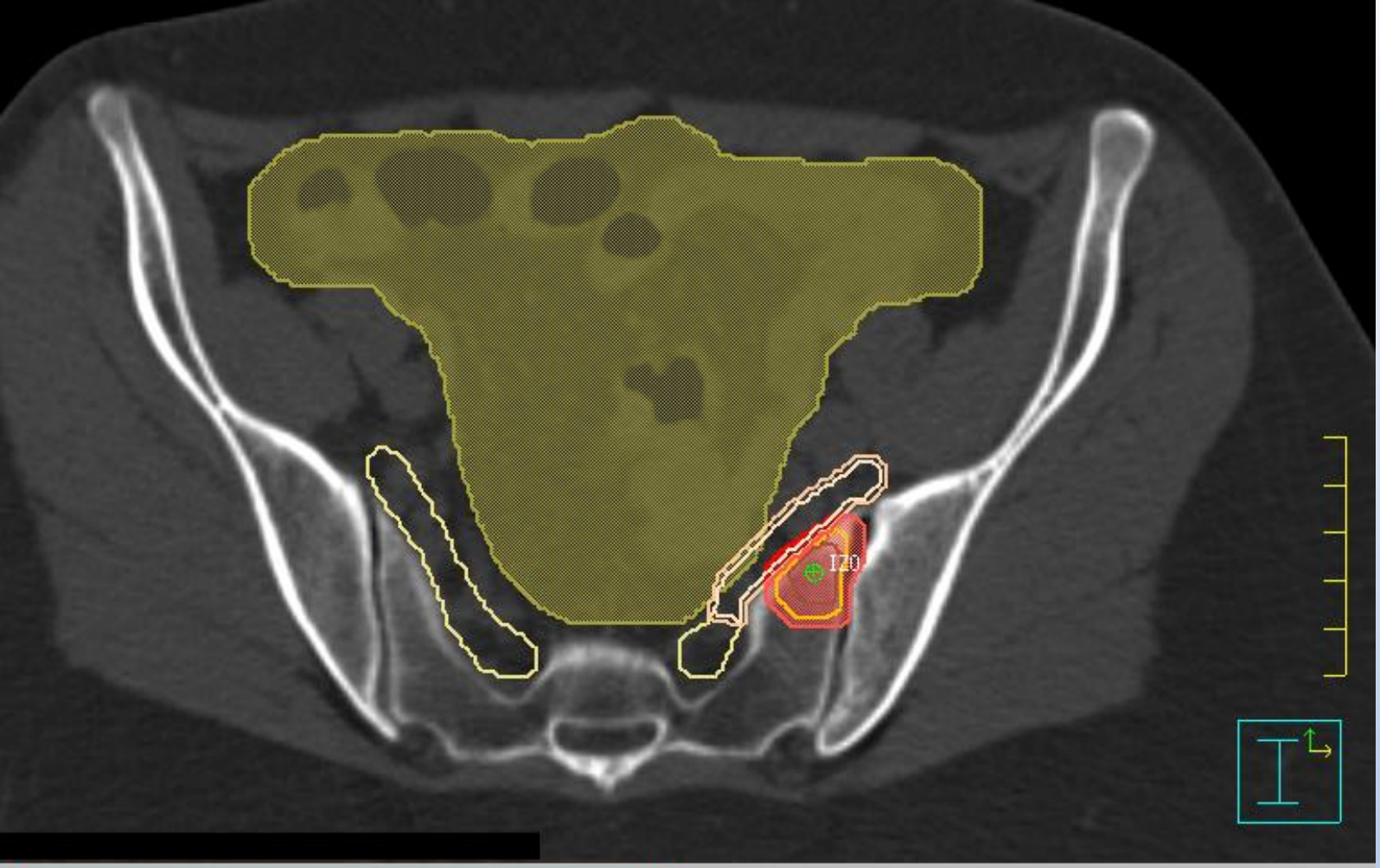
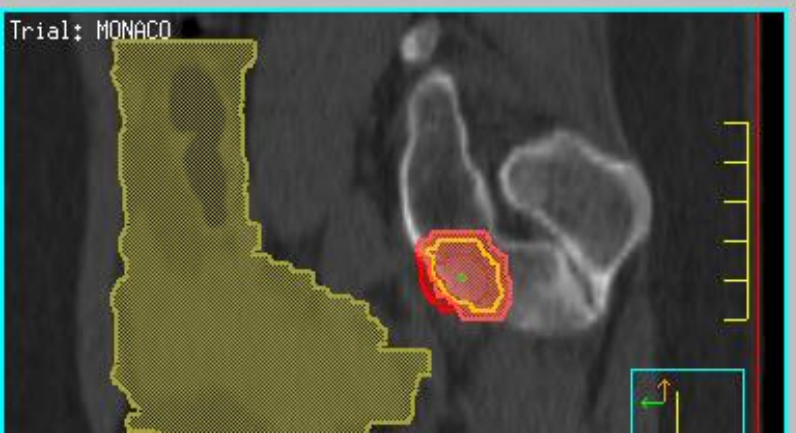
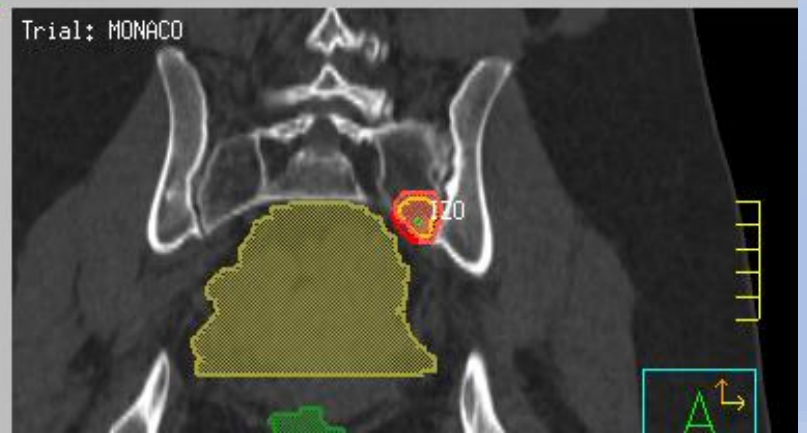
Akceptuj
Ponowne przechw
Powierzchnia
Deformacja
Wideo

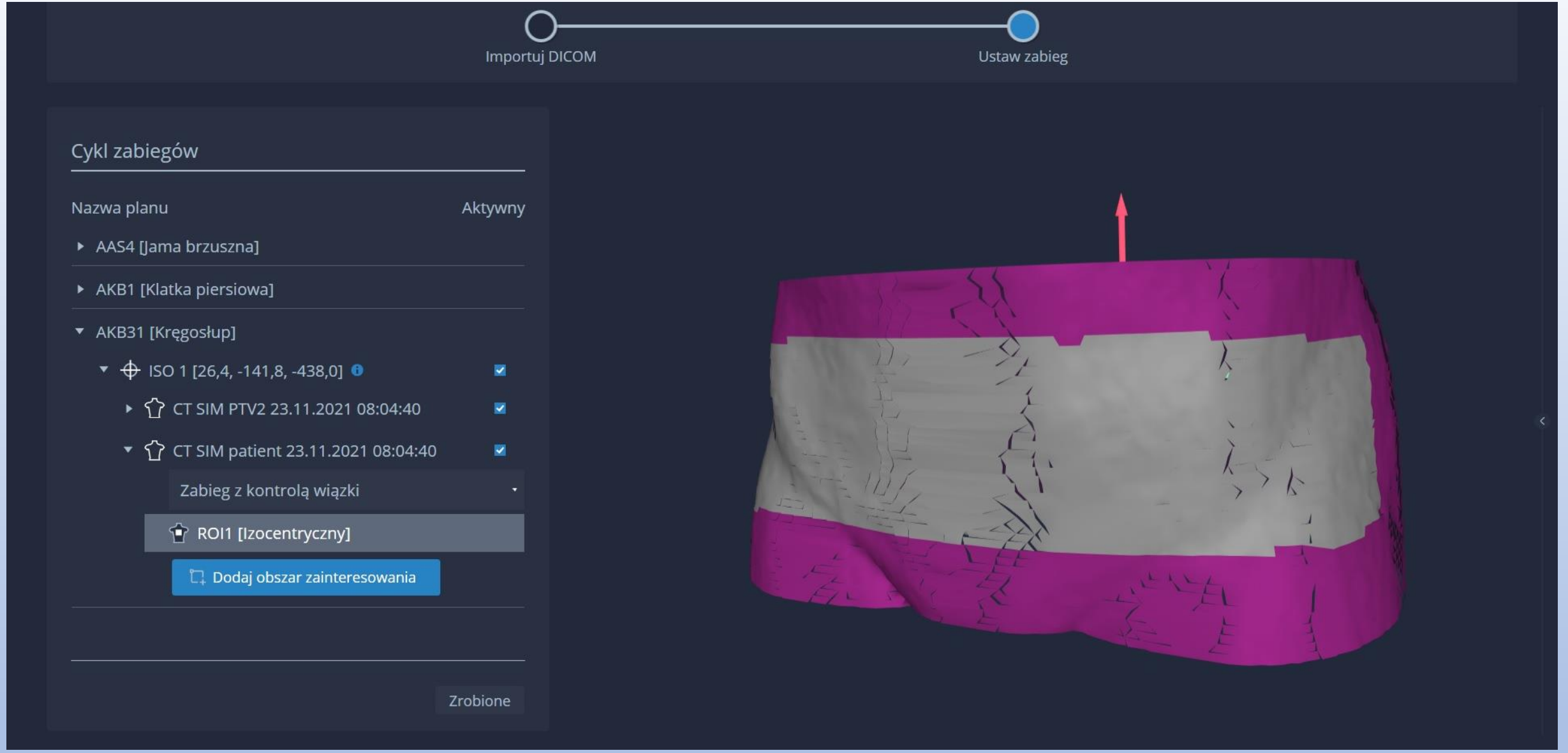






Sacral bone SBRT

50 Gy in 5 fractions, VMAT with 6 MV FFF photons used for dose delivery; 6D robotic couch; AlignRT used for positioning and intrafraction control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Cykl zabiegów
Nazwa planu
Aktywny
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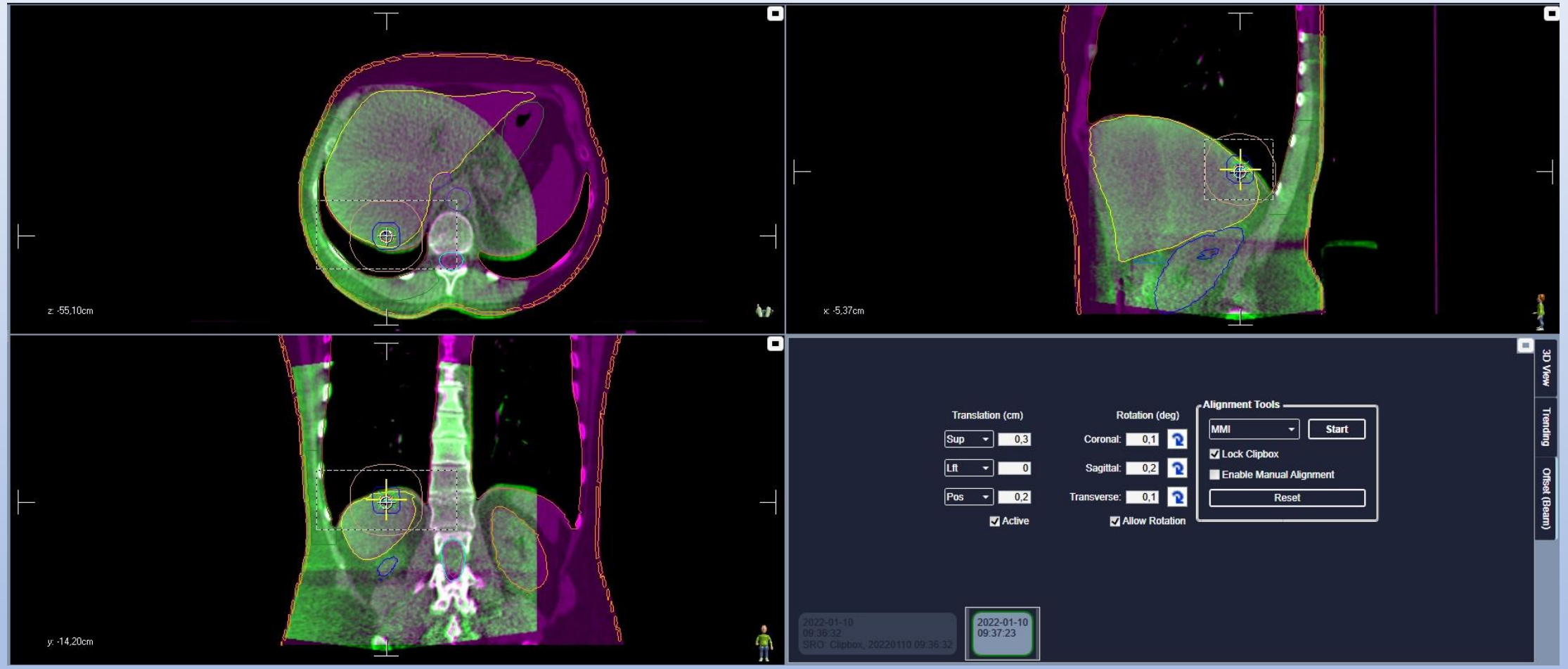
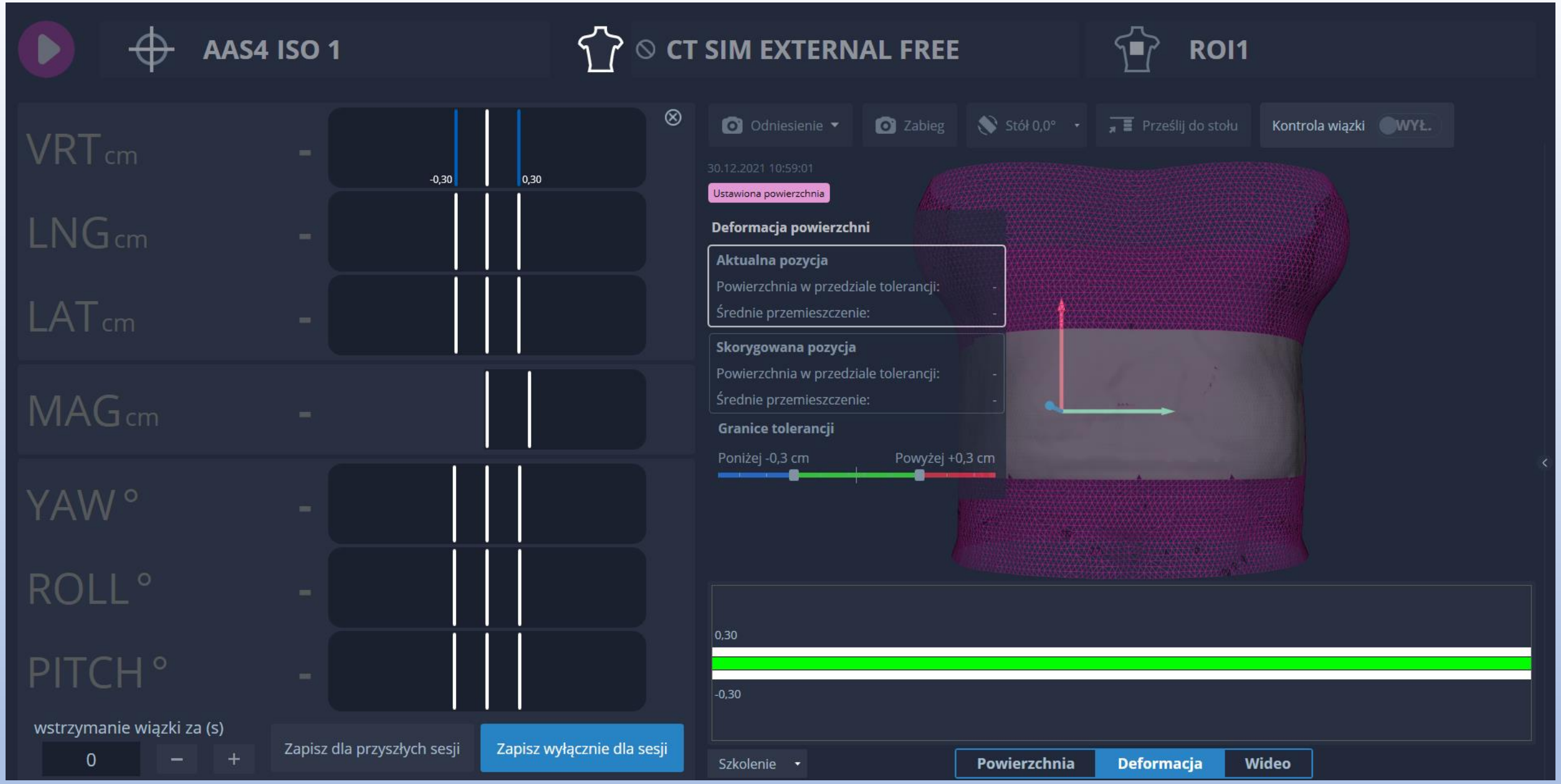
Zabieg z kontrolą wiązki
ROI1 [Izocentryczny]
Dodaj obszar zainteresowania
Zrobione

Liver metastasis SBRT

45 Gy in 3 fractions, using DIBH. VMAT with 6 MV FFF photons used for dose delivery; 6D robotic couch; AlignRT used for positioning and intrafraction control




AAS4 ISO 1
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ROI1
VRT cm
LNG cm
LAT cm
MAG cm
YAW °
ROLL °
PITCH °
-0,30
0,30
wstrzymanie wiązki za (s)
0
Zapisz dla przyszłych sesji
Zapisz wyłącznie dla sesji
Odniesienie
Zabieg
Stół 0,0°
Prześlij do stołu
Kontrola wiązki
WYŁ.
30.12.2021 10:59:01
Ustawiona powierzchnia
Deformacja powierzchni
Aktualna pozycja
Powierzchnia w przedziale tolerancji:
Średnie przemieszczenie:
Skorygowana pozycja
Powierzchnia w przedziale tolerancji:
Średnie przemieszczenie:
Granice tolerancji
Poniżej -0,3 cm
Powyżej +0,3 cm
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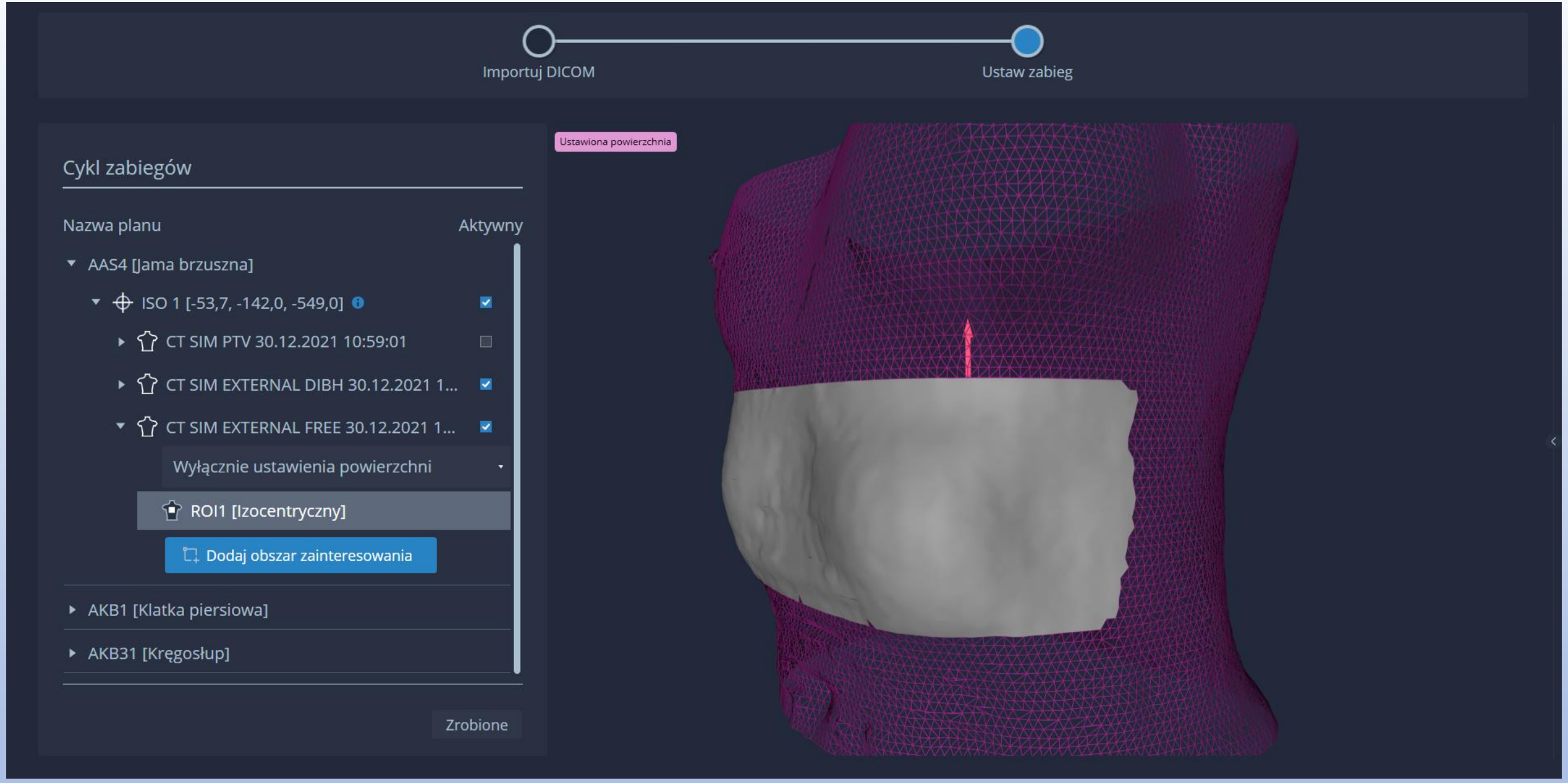
Szkolenie
Powierzchnia
Deformacja
Wideo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Wyłącznie ustawienia powierzchni
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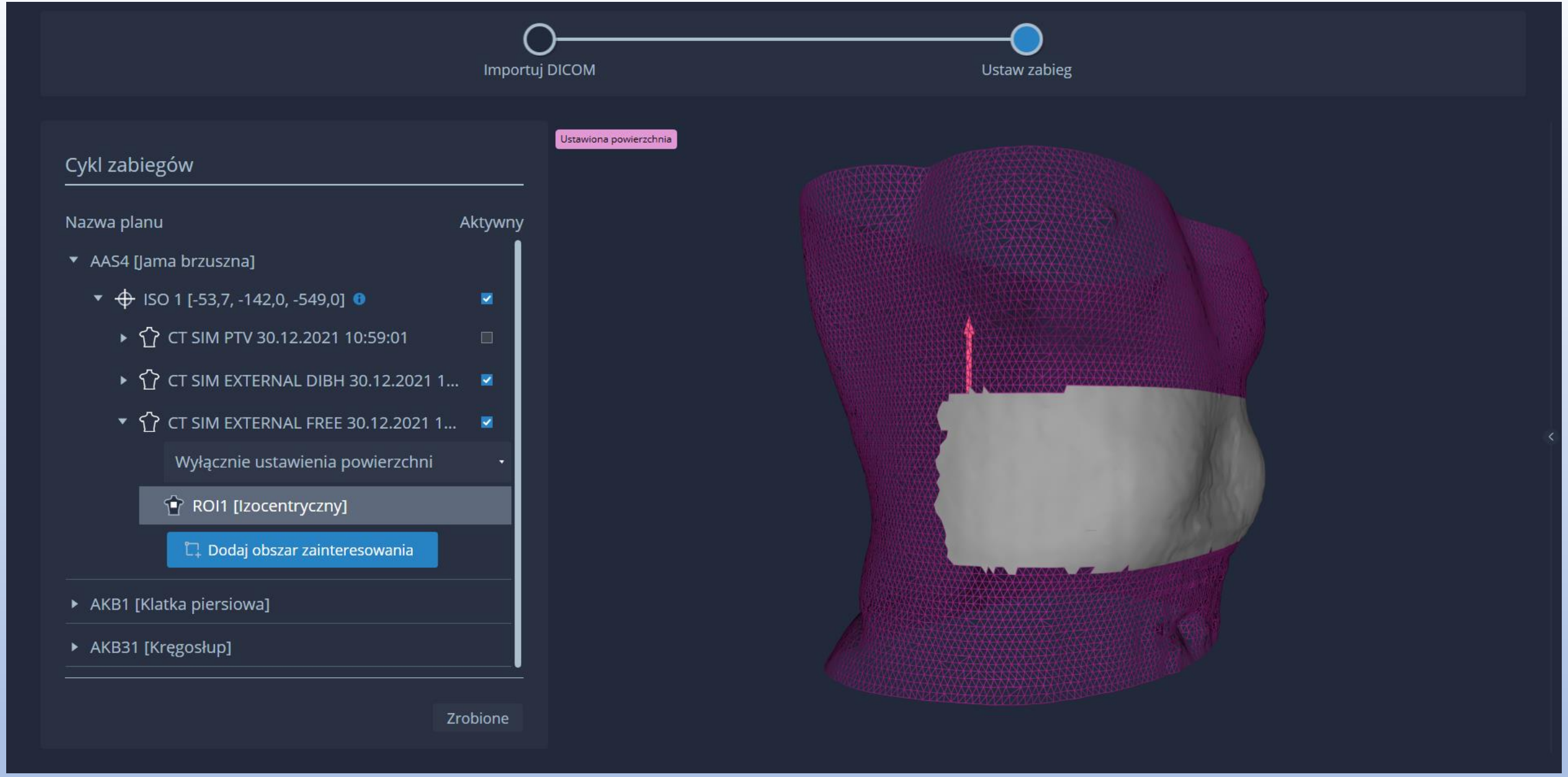
Dodaj obszar zainteresowania
AKB1 [Klatka piersiowa]
AKB31 [Kręgosłup]
Zrobione
Ustawiona powierzchnia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Wyłącznie ustawienia powierzchni
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Dodaj obszar zainteresowania
AKB1 [Klatka piersiowa]
AKB31 [Kręgosłup]
Zrobione
Ustawiona powierzchnia


AAS4 ISO 1
CT SIM EXTERNAL FREE
ROI1
VRT cm
LNG cm
LAT cm
MAG cm
YAW °
ROLL °
PITCH °
-0,30
0,30
Odniesienie
Zabieg
Stół 0,0°
Prześlij do stołu
Kontrola wiązki
WYŁ.
30.12.2021 10:59:01
Ustawiona powierzchnia
0,30
-0,30
wstrzymanie wiązki za (s)
0
Zapisz dla przyszłych sesji
Zapisz wyłącznie dla sesji
Szkolenie
Powierzchnia
Deformacja
Wideo

Translational and rotational tolerance used in SGRT

VRT -0.25 - 0.25 cm

LNG -0.25 - 0.25 cm

LAT -0.25 - 0.25 cm

MAG -0.3 - 0.3 cm

YAW -0.25° - 0.25°

ROLL -0.25° - 0.25°

PITCH -0.25° - 0.25°

Case overview

- After 3 courses of PF chemotherapy and a total of 13 SBRT fractions, the patient reported no notable adverse events related to the SBRT
- Treatment response assessment with imaging was performed
- She was qualified for definitive chemoradiotherapy
- Treatment regimen of 70 Gy in 35 fractions to the head and neck region + 3 courses of DDP (cisplatin; 40 mg/m^2) was introduced
- Treatment finished in **March 2022** with satisfactory tolerance; no adverse events graded higher than 3

Follow-up

- The patient remains under surveillance, with follow-up visits every 2–3 months
- Radiology reported partial remission in the first follow-up imaging in May 2022
- PET scan performed in September 2022 – complete morphological and metabolic response

Last visit to the outpatient clinic – **November 2023**,
no sign of recurrence of the disease in the follow-up imaging

Conclusions

- A selected group of patients can benefit from non-standard approach and local ablative therapy with high doses of radiation
- Recently, the utilization of ablative SBRT in treatment of oligometastatic disease has become increasingly popular. Multiple clinical trials are underway, but more data needs to be accumulated [1]
- Application of stereotactic ablation in oligometastatic cancers of various primary sites was assessed in the SABR-COMET trial, where significant improvements in both OS and PFS were observed [2]
- Guidelines on SABR in oligometastatic disease in various primary cancer sites are being published (NSCLC, prostate cancer), often pointing out lack of objective inclusion criteria or validating studies [3,4]

1. Bahig H, Huang SH, O'Sullivan B. Oligometastatic Head and Neck Cancer: Challenges and Perspectives. Cancers. 2022 Aug [cited 2023 Nov 19];14(16).
2. Harrow S, Palma DA, Olson R, Gaede S, Louie AV, Haasbeek C, et al. Stereotactic Radiation for the Comprehensive Treatment of Oligometastases (SABR-COMET): Extended Long-Term Outcomes. International Journal of Radiation Oncology, Biology, Physics. 2022 Nov 15;114(4):611–6.
3. 3. Iyengar P, All S, Berry MF, Boike TP, Bradfield L, Dingemans AMC, et al. Treatment of Oligometastatic Non-Small Cell Lung Cancer: An ASTRO/ESTRO Clinical Practice Guideline. Practical Radiation Oncology. 2023 Sep 1;13(5):393–412.
4. Zilli T, Achard V, Pra AD, Schmidt-Hegemann N, Jereczek-Fossa BA, Lancia A, et al. Recommendations for radiation therapy in oligometastatic prostate cancer: An ESTRO-ACROP Delphi consensus. Radiotherapy and Oncology. 2022 Nov 1;176:199–207.

Conclusions

- In the presented case, **SGRT allowed for a safe and effective high dose delivery with limited toxicities. AlignRT enabled reliable reproducibility across fractions.**
- **For liver SBRT, DIBH allowed for a reduction of GTV volume from 3 cm^3 (for free breathing) to 0.50 cm^3, further reducing the toxicity to the liver**
- As presented, the technique is versatile across various treatment sites
- Clinical use and quality assurance of SGRT systems have been covered in the **ESTRO-ACROP guidelines** from 2022 [5]
- The decision-making process, especially in cases not covered by the guidelines, should be patient-centered
- More research is required to establish universal guidelines on application of ablative techniques in oligometastatic disease

5. Freislederer P, Batista V, Öllers M, Buschmann M, Steiner E, Kügele M, et al. ESTRO-ACROP guideline on surface guided radiation therapy. Radiotherapy and Oncology. 2022 Aug 1;173:188–96.

Thank You for Your Attention!

Please feel free to ask any questions or share your thoughts.

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