Dr. Franco Canestri
C-RAD GmbH

Neuigkeiten und Praxis im Bereich Gating und Patientenlagerung : Fünf Jahre Erfahrungen mit der C-RAD Lösung in Deutschland.

für :

Treffen von AK IMRT und AK Computer

UKE Hamburg, 28. + 29.05.2018

Agenda

Überblick

… damals in 2013 …

Heute, 4 bis 5 Jahre später

Entwicklungen und Neuigkeiten

Publikationen und Projekte

Video : Stereotaxie mit Elekta / Varian (Lund und Weiden)

Background of the Company

-

Karolinska Institutet

Background of the Presenter

- Ph.D in Medical Physics from University of Genoa and National Cancer Institute of Milan - Italy („Lasers in Surgery and Oncology“)
- Since 35 years in Germany
- Professional Experiences with Hewlett-Packard Medical and Agilent Technologies Optical Division in Böblingen (Product Design). With C-RAD since beginning 2013.
- Scientific Publications : www.franco-canestri.de

End-to-end treatment with monocular single camera solution :

Sentinel 4DCT
in CT room

Siemens, GE, Toshiba and Philips.

Catalyst/SRT/HD/PT/Tomo
in RT room

Multi Vendor
Support

ELEKTA

TomoTherapy

iba

VARIAN medical systems

Siemens

> 5 Jahre Erf. MosaiQ
> 5 Jahre Erf. ARIA

plus Room-Laser Products Family.

C-RAD

C-RAD Room Lasers : TERMINOLOGY

HITSD box

HITM box

Cross

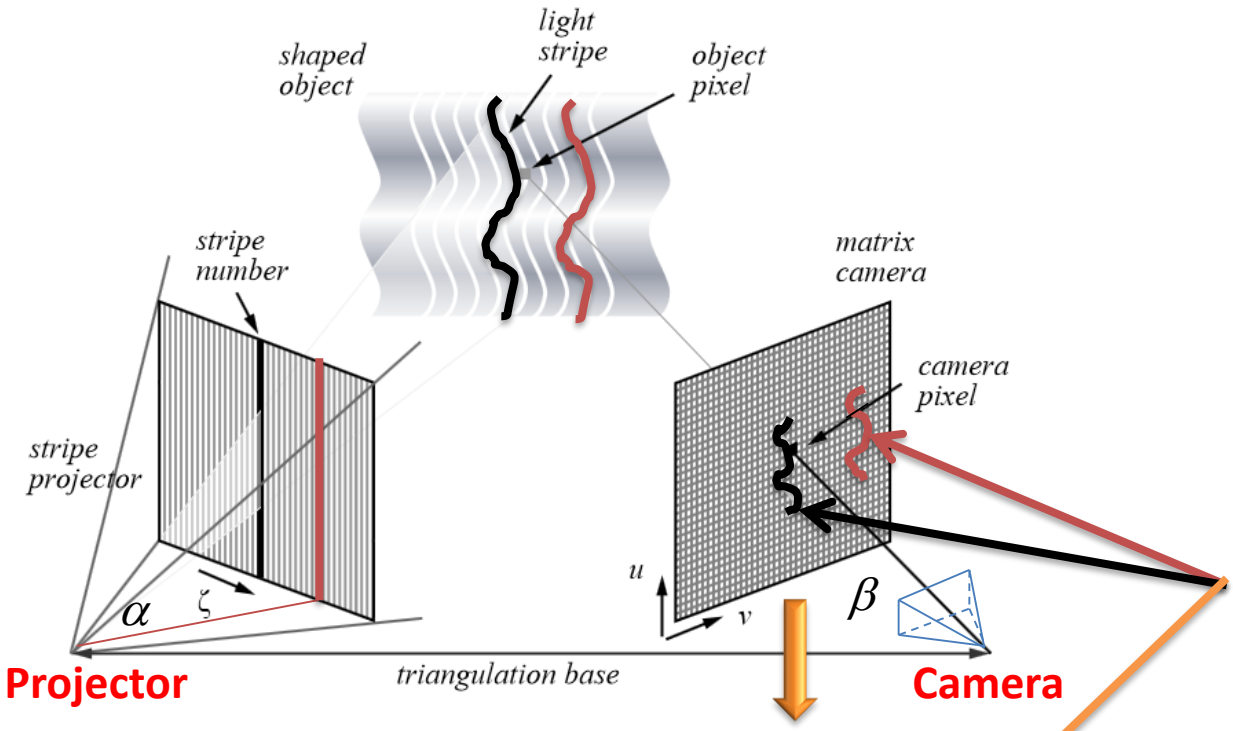
Line

HIT box

To get a cross with only mobile boxes, you need two boxes, as there is only one line possible per box on rail.

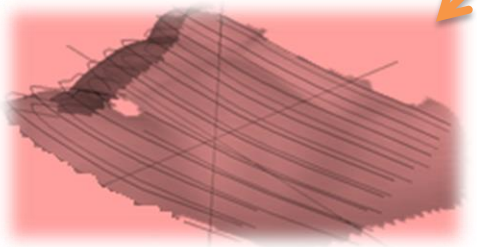
CYRPA MEDICAL SECURITY

Messungen



3D surface capturing with <u>one</u> unit, up to 80 times per second

Patient‘s „signature“

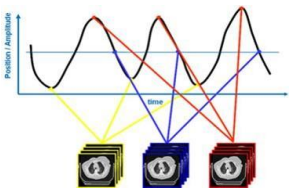


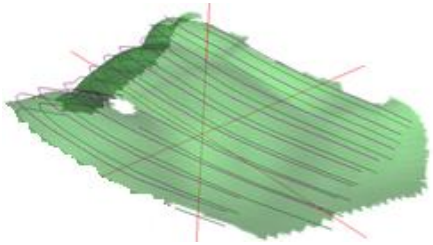
Workflow : RT (first Fraction)

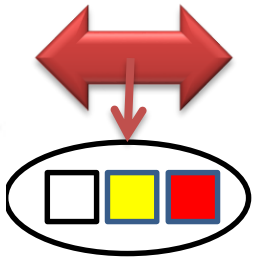
SENTINEL

from CT Room

or via CT Device only, if requested



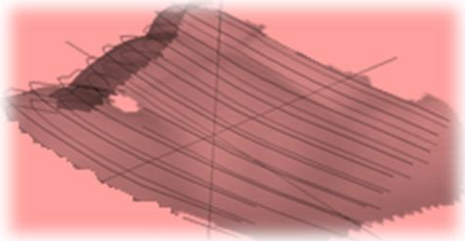


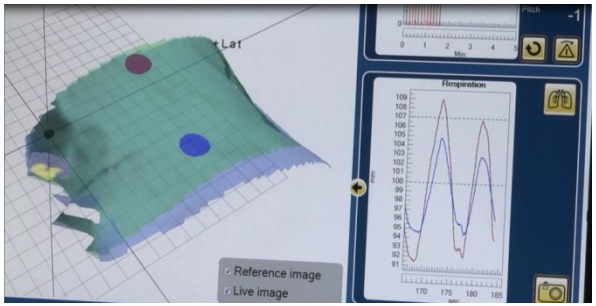


in RT Room

catalyst

- Again : Patient's Surface (now, first fraktion at the Linac)
  + local Gating





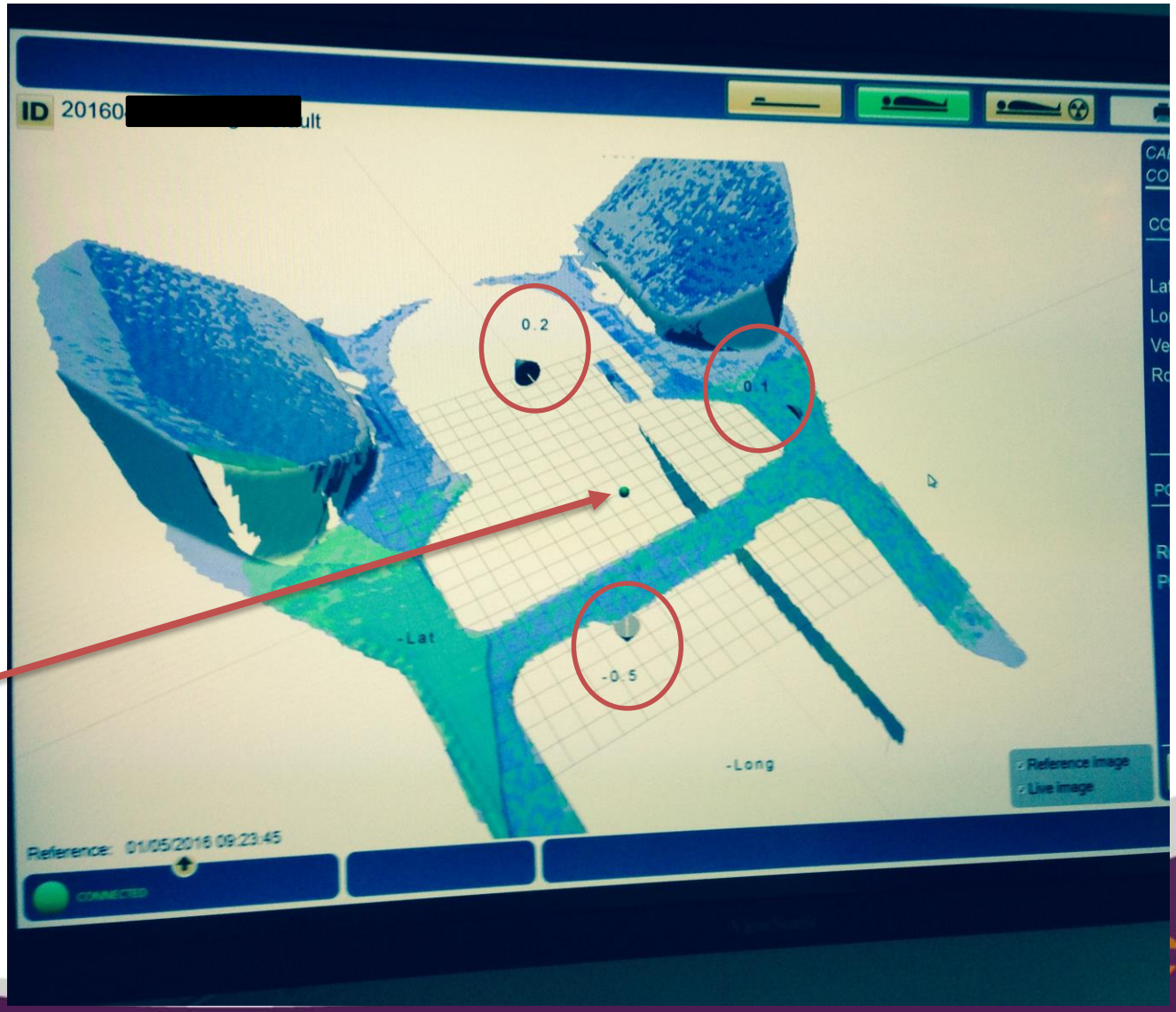
Gating at Linac

Back-projection,
Patient Vicinity & Safety

Isocenter

C-RAD

Workflow in RT : Lagerungshilfe Check am Linac (Genauigkeit < 1 mm. – konfigurierbar)



Isozentrum

Respiratory gating / coaching for ”Deep Inspiration Breath Hold” (DIBH)

„Catalyst“ „Sentinel“

RT ← CT

Patient’s Visual feedback

Exported via DICOM

from 4DCT „Sentinel“

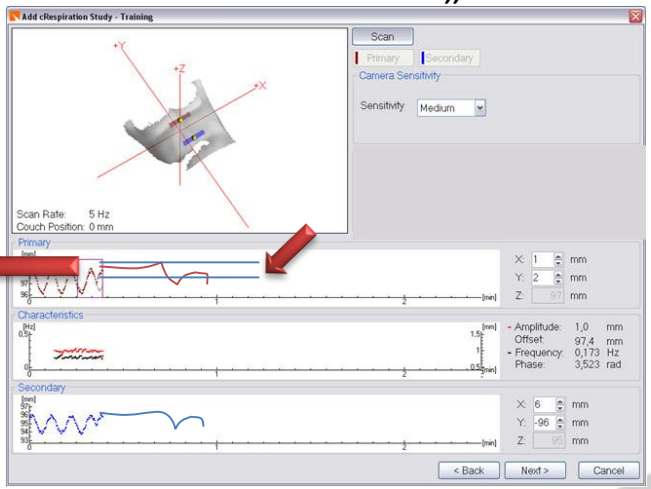
Free breathing

DIBH

Resp. Target

Resp. signal

Base line

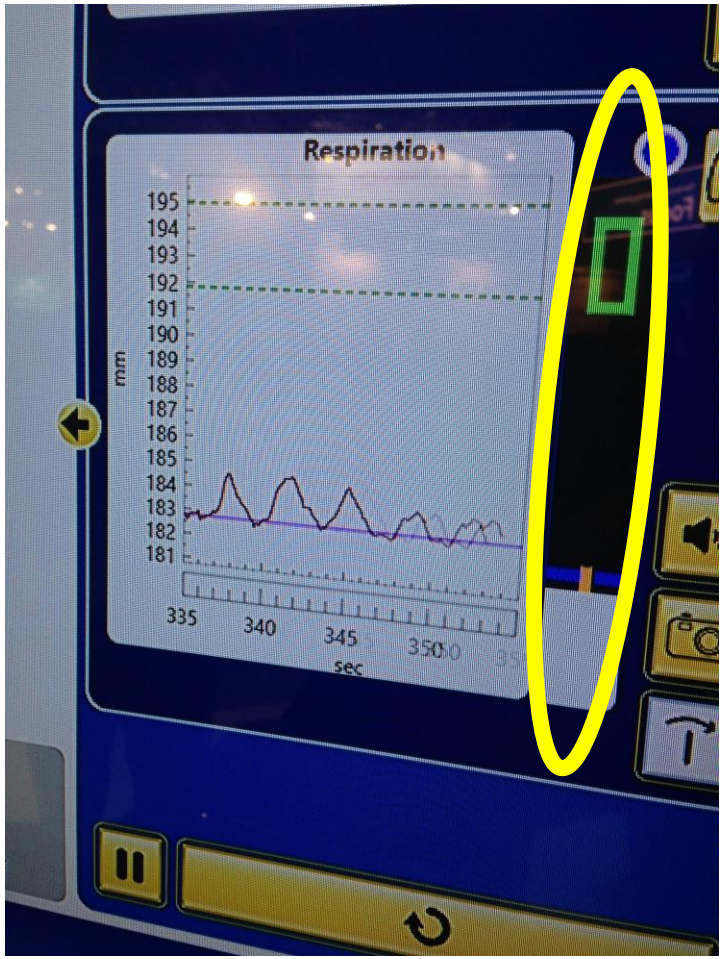


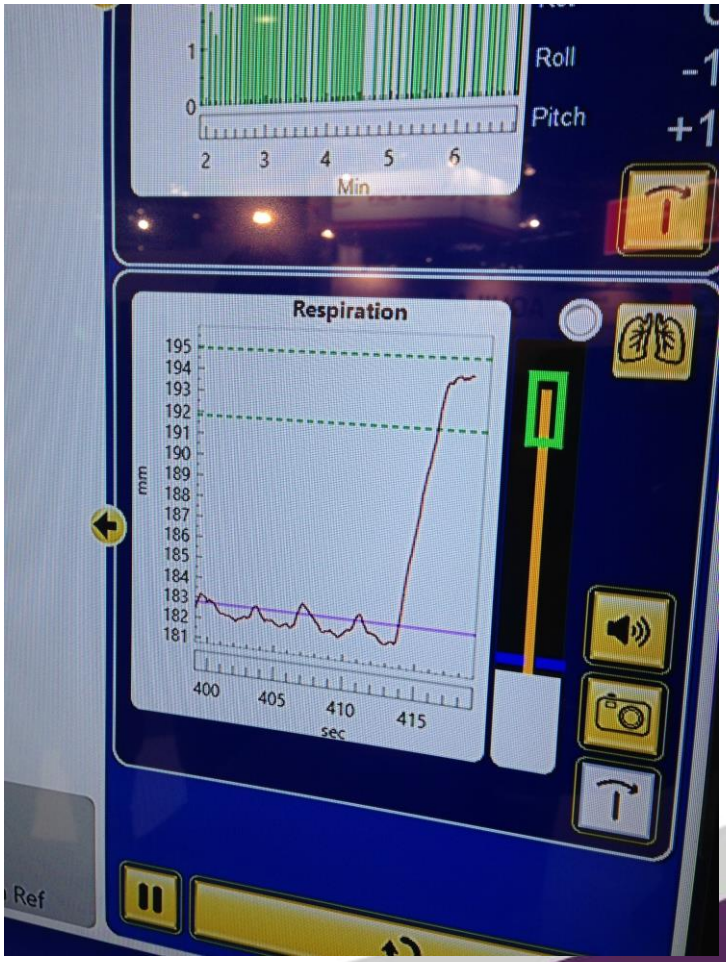
C-RAD

Neue C-RAD Bluethoot Patientenbrille

- **4DCT im CT Raum (Sentinel)**
- **Gating im Linac Raum (Catalyst)**

Patientenbrille : das Signal auch im Kontrollraum





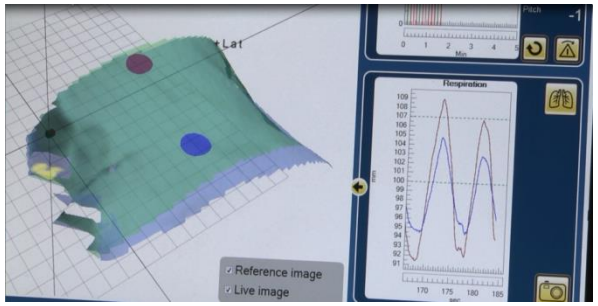
NEW !

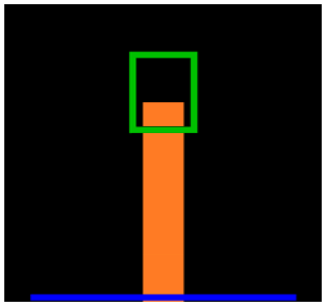
Gating bald auch via **OPASCA Raumlicht** und **C-RAD** „cLight“ Interface von Catalyst.

Mehr Info & Demos : DEGRO 2018 in Leipzig.

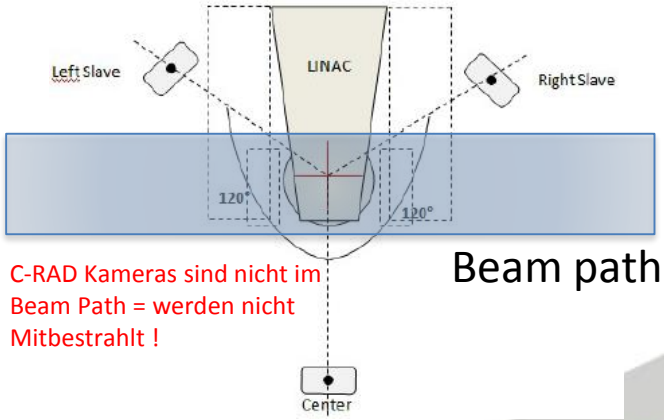
C-RAD

catalyst



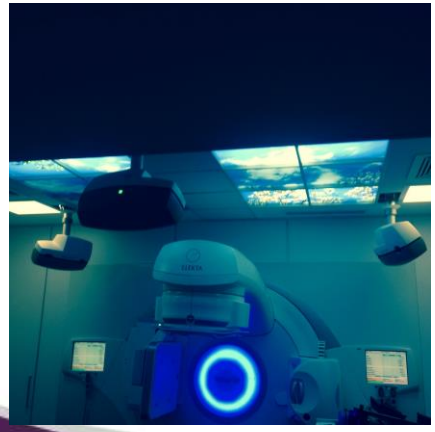


Kooperation mit OPASCA



C-RAD Kameras sind nicht im Beam Path = werden nicht Mitbestrahlt !

Beam path



C-RAD

C-RAD in DE. – damals im März 2013

1 x Mitarbeiter (ich)

Installationen in : Weiden, UMM, LMU Größhadern, Uni Mainz.

Produkte : Sentinel und Catalyst 1-Kamera Version

C-RAD in DE. AUT. CH im Mai 2018

Team mit 10 x C-RAD Mitarbeiter (keine Distributoren)
für die deutschsprachige Region.

37 x Installationen (Kliniken, Uni Kliniken, Praxen)
87 Systeme.

Karolinska

Lund (multi-vendor)

MD Anderson, u.v.a

Universitäten / Referenzzentren :

Freiburg (multi-vendor !),	**Köln,**	**UMM,**
LMU (Gr. + Inn.),	**Bonn,**	**UKE Essen,**
Aachen,	**Mainz,**	**Graz.**

RESEARCH FELLOW PROGRAM
C-RAD

Produkte : Sentinel, Catalyst, Catalyst HD,
Raum Laser Familie, SRT, PT, Tomo

Team Deutschland : 9 x deutschsprachige Mitarbeiter (Status März 2018).

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C-RAD 1 x MTRA Applikationsspezialist C-RAD + Elekta
C-RAD 1 x MTRA Applikationsspezialist C-RAD + Varian

C-RAD

Ab April 2018 : 1 x Extra Applikationsspezialist in AUTRIA

C-RAD

Publikationen und R&D

DE.

Schönecker et al. Radiation Oncology (2016) 11:143
DOI 10.1186/s13014-016-0716-5

Radiation Oncology

RESEARCH Open Access

Treatment planning and evaluation of gated radiotherapy in left-sided breast cancer patients using the Catalyst™/ Sentinel™ system for deep inspiration breath-hold (DIBH)

S. Schönecker[1], F. Walter[1], P. Freislederer[1], C. Marisch[2], H. Scheithauer[1], N. Harbeck[3], S. Corradini[1*] and C. Belka[1]

Abstract

Background: There is a potential for adverse cardiovascular effects in long-term breast cancer survivors following adjuvant radiotherapy (RT). For this purpose, the deep inspiration breath-hold technique (DIBH) has been introduced into clinical practice, to maximally reduce the radiation dose to the heart. However, there are a variety of DIBH delivery techniques, patient positioning and visual patient feedback mechanisms. The aim of the present study was to evaluate the application of radiotherapy in DIBH using the Catalyst™/Sentinel™ system, with a special emphasis on treatment planning and dosimetric plan comparison in free breathing (FB) and DIBH.

Patients and methods: A total of 13 patients with left-sided breast cancer following breast conserving surgery were included in this prospective clinical trial. For treatment application the Catalyst™/Sentinel™ system (C-RAD AB, Uppsala, Sweden) was used and gating control was performed by an audio-visual patient feedback system. CT and surface data were acquired in FB and DIBH and dual treatment plans were created using Pencil Beam and Collapsed Cone Convolution. Dosimetric output parameters of organs at risk were compared using Wilcoxon signed-rank test. Central lung distance (CLD) was retrieved from iView™ portal images during treatment delivery.

Results: The system contains a laser surface scanner (Sentinel™) and an optical surface scanner (Catalyst™) interconnected to the LINAC systems via a gating interface and allows for a continuous and touchless surface scanning. Overall, 225 treatment fractions with audio-visual guidance were completed without any substantial difficulties. Following initial patient training and treatment setup, radiotherapy in DIBH with the Catalyst™/ Sentinel™ system was time-efficient and reliable. Following dual treatment planning for all patients, nine of 13 patients were treated in DIBH. In these patients, the reduction of the mean heart dose for DIBH compared to FB

„fast and reliable solution in RT“

„significantly reduces high and mean dose delivery to the heart during DIBH“

C-RAD

DE.

UMM
UNIVERSITÄTSMEDIZIN
MANNHEIM

Medizinische Fakultät Mannheim
der Universität Heidelberg

Universitätsklinikum Mannheim

Laser Tracking vs. CBCT for Patient Positioning

Stieler F, Wenz F, Lohr F
Department of Radiation Oncology, University Medical Center Mannheim, University of Heidelberg, GERMANY

Original article

Strahlenther Onkol 2013 · 189:938–944
DOI 10.1007/s00066-013-0441-z
Received: 11 July 2013
Accepted: 31 July 2013
Published online: 27. September 2013

F. Stieler · F. Wenz · M. Shi · F. Lohr
Department of Radiation Oncology, University Medical Center
Mannheim, University of Heidelberg, Mannheim

A novel surface imaging system for patient positioning and surveillance during radiotherapy

A phantom study and clinical evaluation

„optimizes the CBCT usage frequency“
„minimizes intrafr. patient positioning errors and allows monitoring of moving tumors for gating“

DIBH in Bauchlage (Indik. : Pankreas, Wirbelsäule, u.a.) – DE. AUT. CH Region

DIBH in the prone position

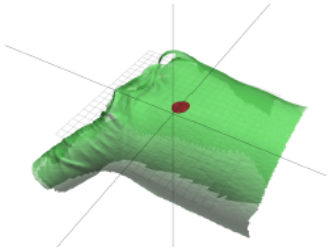
July 12, 2017

Abstract

The prupose is to investigate the possibility of peforming Deep Inspiration Breath Hold (DIBH) in the prone position using the C-RAD's optical surface imaging systems, the Sentinel and Catalyst.

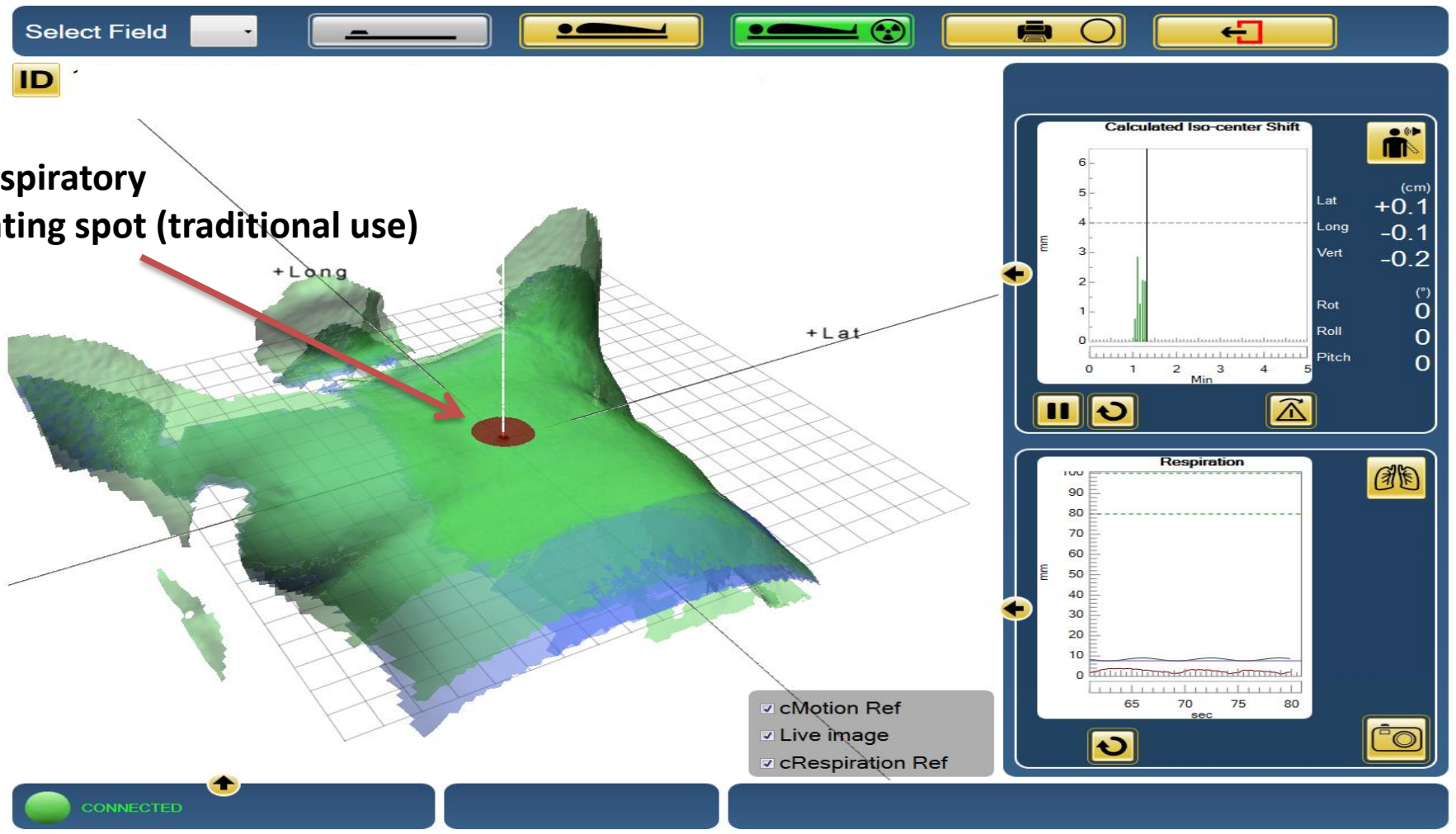
I. Introduction

The ability to performing DIBH in the supine position is well know. The performance of the Sentinel and Catalyst when performing DIBH in the prone position is not yet as documented, an initial comparison between supine and prone respiratory gating is therefor of interest.



Flexibilität des Systems … mit / ohne Brille

Respiratory
Gating spot (traditional use)

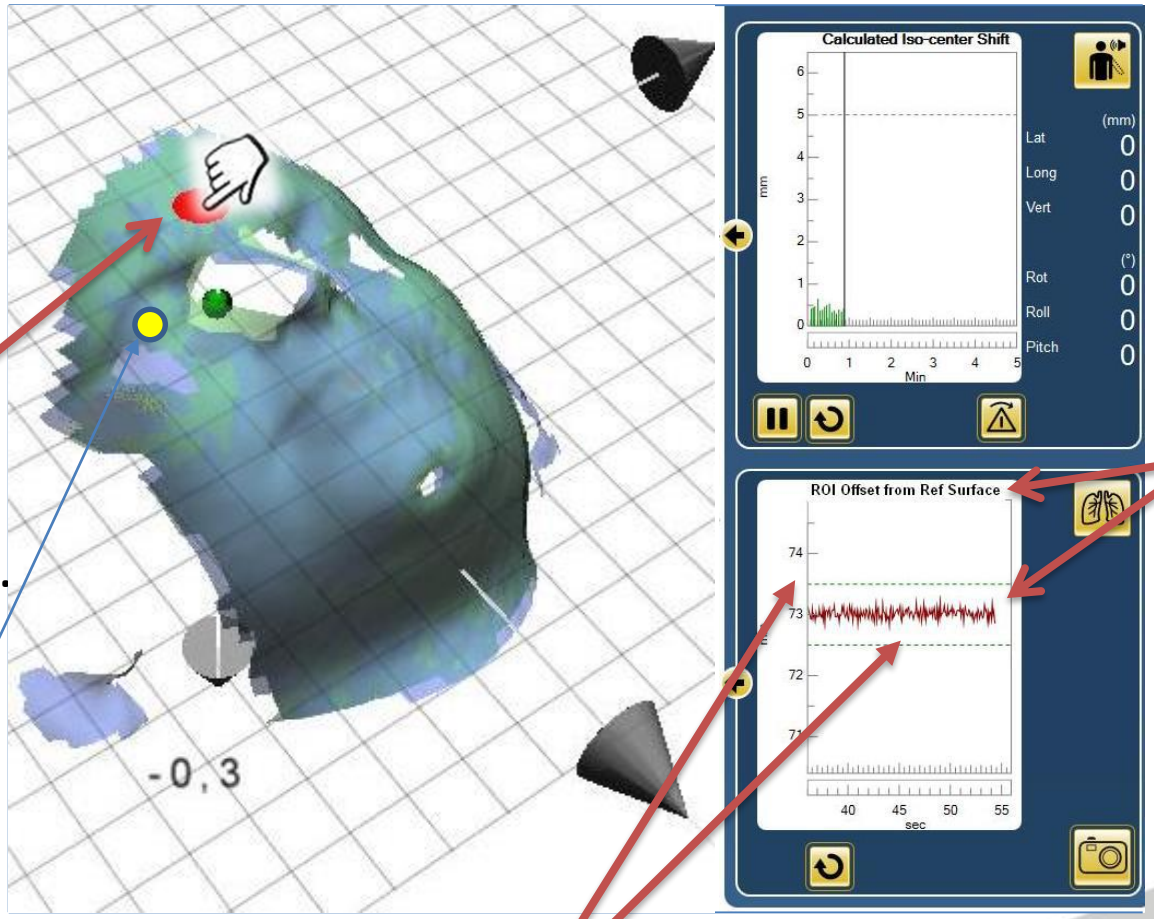


Head & Neck … ohne Masken … (Sweden und DE.)

"Reduced fixation with optical monitoring for palliative whole brain radiotherapy treatment".

Silke Engelholm at al.

Radiation Physics, Skåne University Hospital, Lund, Sweden



„Gating" primary spot …

Secondary spot also available (Eye Motions Research Project in DE.)

Sicherheitsfenster

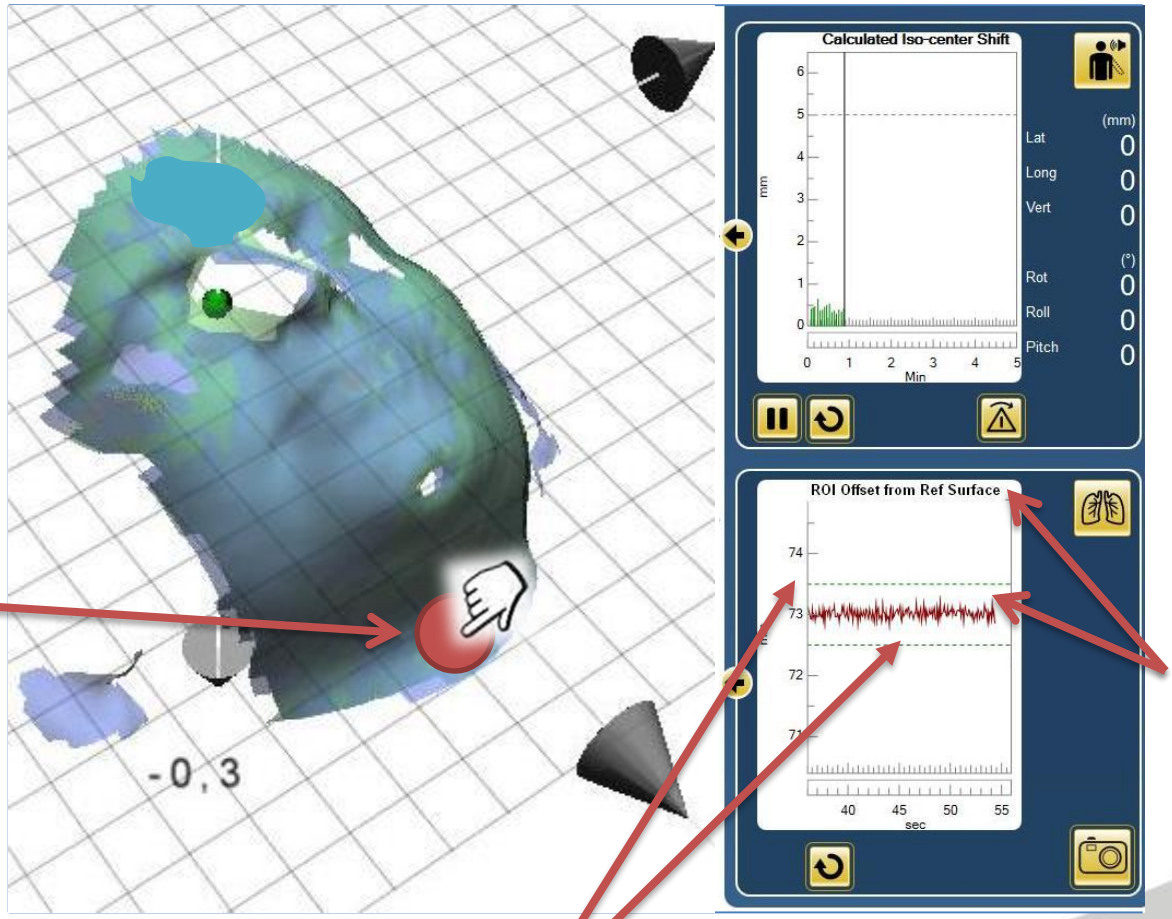
C-RAD

Head & Neck … ohne Masken … (USA und DE.)

"Application of Surface Mapping in detecting Swallowing for Head & Neck Cancer"

David Shepard et al. - Swedish Hospital Seattle, USA

„Gating" spot …



Sicherheitsfenster

DE.

LMU KLINIKUM DER UNIVERSITÄT MÜNCHEN

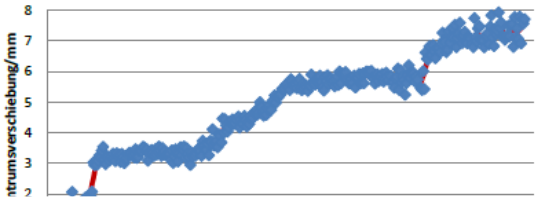
CAMPUS GROSSHADERN UND INNENSTADT
Klinik und Poliklinik für Strahlentherapie und Radioonkologie
Prof. Dr. C. Belka

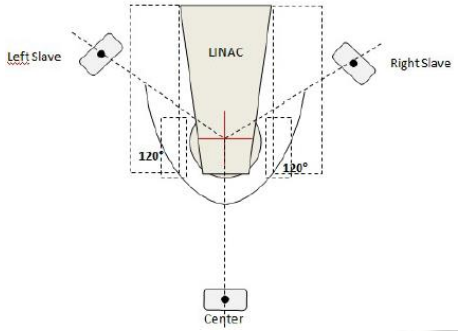
Evaluation der Möglichkeit einer Ganzhirnbestrahlung in freier Lagerung ohne Maske bei Lageüberwachung durch den Oberflächenscanner Catalyst™ HD

Reiner M., Jahn T., Freislederer P., Kamp F., Corradini S., Belka C.

Fragestellung

Können z.B. klaustrophobische Patienten bei alleiniger Lageüberwachung durch einen Oberflächenscanner ohne Maske sicher einer Ganzhirnbestrahlung unterzogen werden?

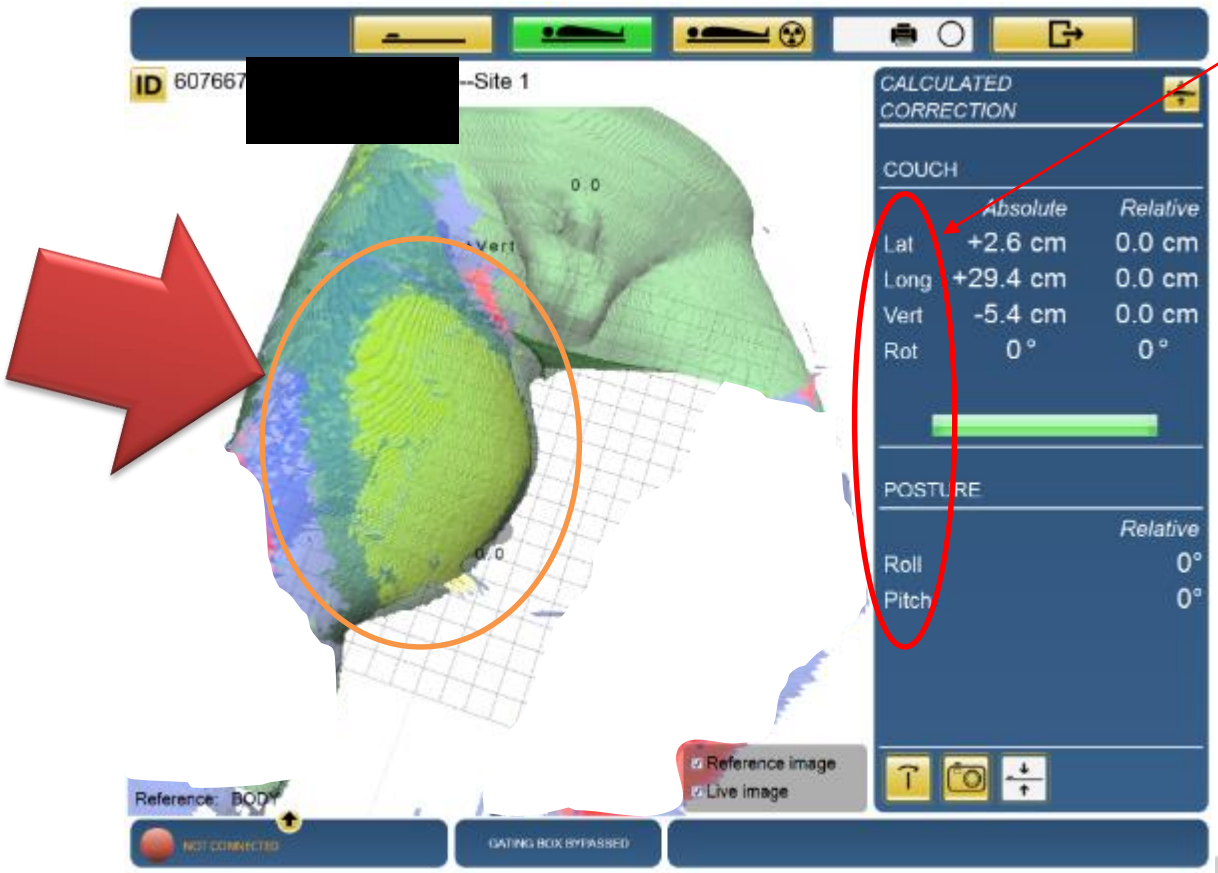




„möglich ohne Maske“
„Kinnmaske“

C-RAD

Sarcoma Positioning after / during Pharmaceutical Treatment (DE. Studie, C-RAD Rück-Projektion – paten.)



C-RAD Catalyst‘s „cPositioning“ shows fraction-by-fraction surface changes …

1 x configurable ROI is clinically relevant.

ESTRO 2018

Optical surface scanner, indexed patient support and IGRT make skin markers obsolete for patient positioning in external beam radiotherapy

Schilling, Philipp; Tümmler, Heiko; Gauder, Sandra
Städtisches Klinikum Dresden; Abteilung und Praxis für Strahlentherapie; Friedrichstr. 41, 01067 Dresden

Results

Our investigation shows no significant difference between the two methods regarding the remaining rotational deviations, MLM performs slightly better for chest and inferior to MBM for abdomen, although not significantly (see image (1)). As both methods presume correlation between patient's surface and bony anatomy the final accuracy is still strongly patient-dependent. However, with treatment workflow and patient comfort in mind the MLM includes several advantages:

(1) no skin markers required,
(2) higher patient safety due to independent and consistent support device positioning,
(3) deformations can be corrected efficiently using information of the surface scanner and
(4) after a training period the workflow is fast and straightforward.

Conclusion

The presented new method (MLM) allows positioning of patients at least as accurate as the common used practice with skin marks. Our clinic is applying this method since 01/2016.

[1] Martens R et al. The workflow and benefits of patient positioning based on absolute table coordinates. ESTRO33 2014, Poster RTT track

C-RAD

OPASCA und C-RAD :

Patient Validation

Ab April 2018 !

- 1/million cases false rate
- vs. finger print solution: 20 times higher accuracy
- Face recognition based technology
- Auto learning capability - fit the dynamic clinical situation
- Integrated in C-RAD solution

C-RAD

C-RAD

C-RAD Eigenschaften als Vorsprung gegenüber der Konkurrenz :

1) Rück-Projektion Rot – Gelb (Patentiert), auch für Lagerungshilfe Monitoring,

2) Nicht-rigide und rigide Registrierung je nach ROI,

3) 0.3 mm Genauigkeit,

4) Mehr als 5 Jahre Erfahrungen mit Varian, Elekta, MosaiQ und ARIA,

5) 360 Grad Abdeckung (Stereoaxie 3-Kamera Version),

6) Die Kameras werden nie mit-bestrahlt,

7) OPASCA, PT, TOMO und alle CTs Interfaces,

8) x-RAY EPID (siehe Press Release),

9) Raum-Laser Familie,

10) Sehr flexibel Einsatz des Gating Spots (Publikationen).

10 Mitarbeiter Team in DE.

Thank you for your attention !

→ **Videos**

www.c-rad.se

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