Positioning Bolus with a Tattoo-free Workflow

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Who am I?

- SABR and Motion Management Radiographer at Lincoln County Hospital and East Midlands Radiotherapy Network
- Three Varian Truebeam machines all with AlignRT Advance
- Tatooless and all Head and Neck patients treated in an open mask with SGRT for setup and monitoring

Contents

The Problem

Predates Tattoo-free

Bolus positioning has always been awkward.

Multiple Materials

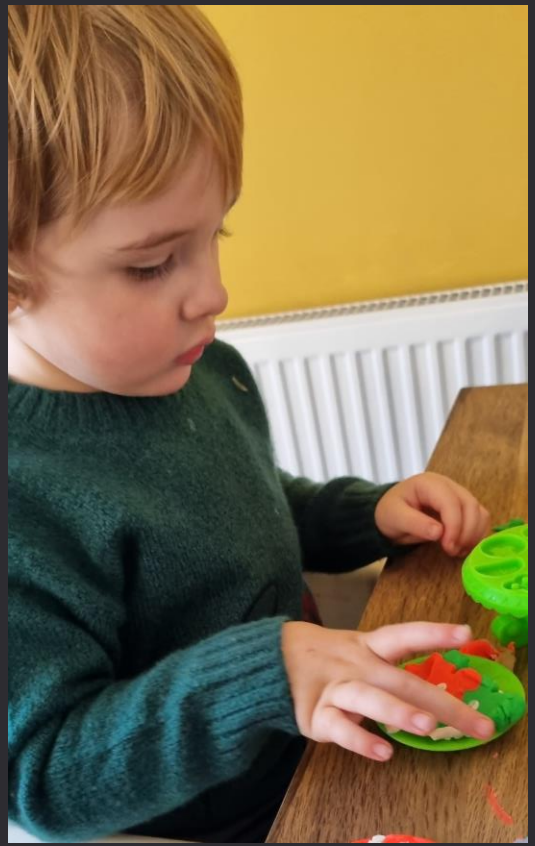
Different bolus materials, some SGRT friendly, some not.

Increased Complexity

As techniques grow more complex so to does the bolus.

So what's the answer?

Bolus is difficult with tattoos so surely removing them makes it even harder?



Postural Video

Easy

A toddler could do it.

Quick

Quicker than measuring from a tattoo.

Postural Video for Bolus Positioning

01 Export

Send plan from planning system to AlignRT.

02 Import

Find the patient under ‘New Plans Received’.

03 Select Structures

Select the normal structures plus the bolus structure.

04 Draw ROI

Draw your normal ROIs but also draw an ROI over the bolus structure.

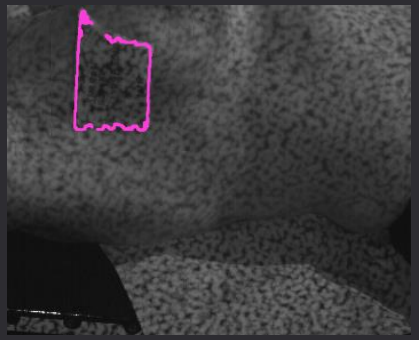
Postural Video for Bolus Positioning

Position Patient

Follow the normal procedure to position the patient.

Switch Structure

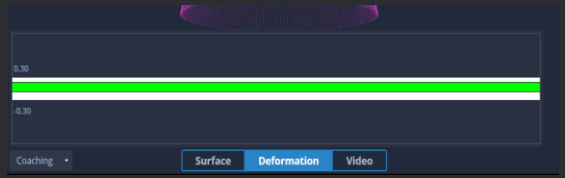
Switch over to the bolus structure.



Position Bolus

Get the bolus so it's within the pink lines, using different camera angles.

DIBH Workaround

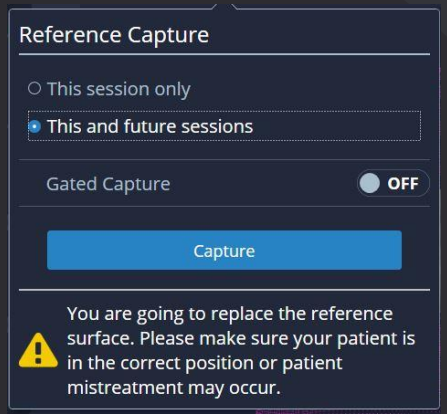


Position Patient

Ensure patient is achieving breath hold.

Preparation tab

Switch to preparation to deactivate the free-breathing surface.



SGRT Capture

Get the patient into breath hold, position the bolus and take an SGRT capture to use on subsequent fractions.

Audit

Retrospective Analysis

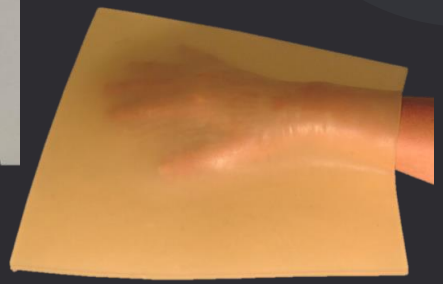
Of five patients for each bolus type with each placement method

Three Bolus Types

3D-Printed
Shaped Parrafin
Generic Sheet Bolus

Placement Methods

Measurements from tattoo
Postural Video



3D-Printed

Tattoos

Average Discrepancy (mm/°)		Largest Discrepancy (mm/°)	
Vert	0.34	Vert	0.68
Long	0.37	Long	2.16
Lat	0.16	Lat	0.64
Yaw	0.8	Yaw	4.1
Roll	3.2	Roll	8.5
Pitch	4.1	Pitch	6.2

Postural Video

Average Discrepancy (mm/°)		Largest Discrepancy (mm/°)	
Vert	0.11	Vert	0.35
Long	0.14	Long	0.22
Lat	0.07	Lat	0.31
Yaw	0.4	Yaw	1
Roll	0.8	Roll	2.4
Pitch	0.7	Pitch	1.4

Shaped Parrafin

Tattoos

Number of Fractions with 100% Bolus Coverage	
Breast	9/15
Pelvis	12/20
Pelvis	16/30
H&N	25/30
Palliative Chest	7/10
Average	66%

Postural Video

Number of Fractions with 100% Bolus Coverage	
Breast	18/20
Pelvis	20/20
Pelvis	27/30
H&N	30/30
Palliative Pelvis	13/15
Average	94%

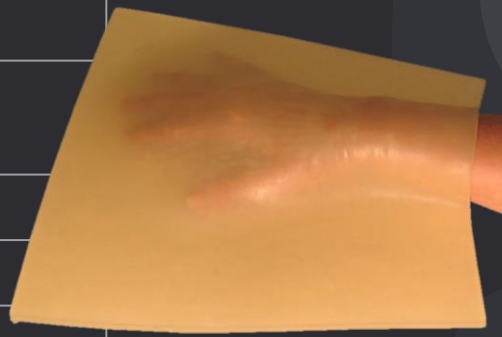
Generic Sheet Bolus

Tattoos

Number of Fractions with 100% Bolus Coverage	
Palliative Breast	6/6
Breast	9/15
Palliative Pelvis	9/10
Palliative SCF	5/5
Palliative Pelvis	10/10
Average	85%

Postural Video

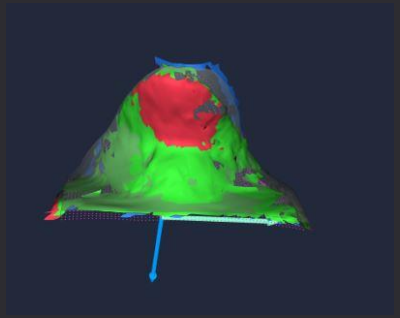
Number of Fractions with 100% Bolus Coverage	
Palliative Shoulder	5/5
Palliative Chest	10/10
Breast	15/15
Pelvis	20/20
Palliative Chest	10/10
Average	100%



Air Gaps?

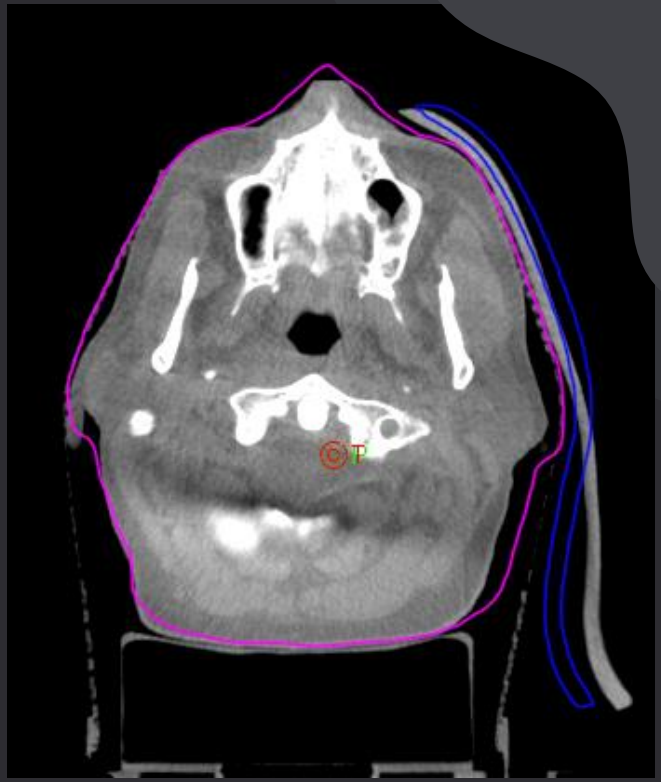
Identify on imaging

Postural video does a great job but sometimes on CBCT air gaps can be seen.



Deformation

After positioning the bolus, the deformation tab can highlight air gaps.



The next step

3D-Printed Mould

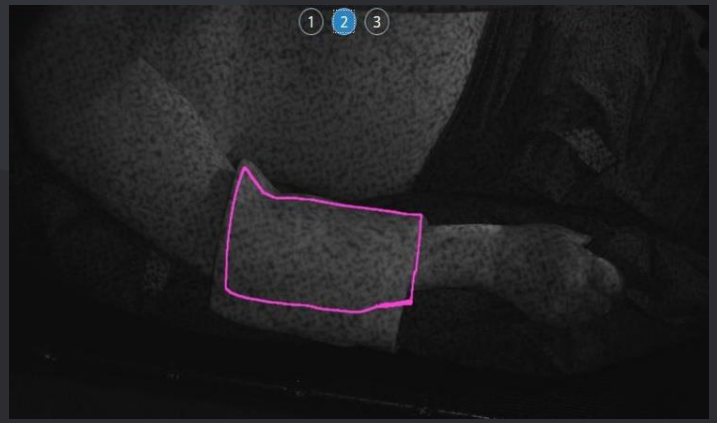
A negative of the bolus is 3D-Printed to create a mould for silicone.

AlignRT friendly Silicone

The silicone is dyed a flesh color so it can be detected by AlignRT.

Postural Video

Primary positioning with postural video, if air gaps are seen deformation can be used.



Case Study

VMAT Right Forearm

Complex case with bolus required over anterior forearm.

SGRT

SGRT used to position the arm and the bolus.

Any Questions?