Planning Tips & Tricks for Breast Treatments

NANCY SCHAUER, CMD, SENIOR CLINICAL APPLICATIONS SPECIALIST ACCURAY INCORPORATED
Breast Planning Tips and Tricks

Topics

• Factors for creating the best treatment plans
• Points to consider for TomoHelical™ breast plans
• Points to consider for TomoDirect™ breast plans
• Deciding between 3DCRT and IMRT
• Evaluating how parameters affect beam-on times
Breast Planning Tips and Tricks

Breast Planning Compared to Other Plans

- Pitches in general need to be tighter because of blocking needs for breast planning
- TomoHelical™ Breast plans require slightly higher modulation factor (MF) [~2-2.3]
- TomoDirect™ breast plans need lower MF [~1.5-2]
Why is Pitch so Important?
TomoHelical™ Breast Planning
Breast Planning Tips and Tricks
Pitch Selection – Effect on Dose Homogeneity

For illustrative purposes only, diagram uses a limited number of projections and does not account for couch and/or MLC movement.
Breast Planning Tips and Tricks

Pitch Selection – Effect on Dose Homogeneity

Example of a non-optimal pitch

For illustrative purposes only, diagram uses a limited number of projections and does not account for couch and/or MLC movement.
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Pitch Selection – Effect on Dose Homogeneity

NOTE: This example has no blocks! Pitch selection should change when using blocks.

For illustrative purposes only, diagram uses a limited number of projections and does not account for couch and/or MLC movement.
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Pitch Selection – Effect on Dose Homogeneity

The same “optimal” pitch as before...

Note how adding a block changes the homogeneity!

Tighter pitch should be selected

0 degrees

180 degrees

For illustrative purposes only, diagram uses a limited number of projections and does not account for couch and/or MLC movement
Choosing an Optimal Pitch for TomoHelical™ Breast Planning
Breast Planning Tips and Tricks
Pitch Selection – How to Choose the Optimal Pitch

What pitches will give the most homogeneous dose?

Based upon early data, a lot of users think it would be these...

... but the answer actually depends upon the plan.

If you have VoLO™, exploring pitches in planning is fast!
Breast Planning Tips and Tricks

Pitch Selection – How to Choose the Optimal Pitch

Theoretical analysis of the thread effect in helical TomoTherapy
Mingli Chen, Yu Chen, and Quan Chen, Accuray Inc., Weiguo Lu, 21st Century Oncology
(Received 17 May 2011; revised 17 August 2011; accepted for publication 7 September 2011; published 17 October 2011)

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Medical Physics, Vol. 38, No. 11, November 2011
Breast Planning Tips and Tricks
Examples of Different Pitches

| TomoHelical™ 3DCRT |
| TomoEDGE™ 5cm Dynamic Jaws |
| VoLO™ Treatment Planning |
Breast Planning Tips and Tricks

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.215

.225
Breast Planning Tips and Tricks

Choosing a Pitch

Optimal pitches will vary depending on the plan field width and target axial offset from the isocenter.

For illustrative purposes only, diagram uses a limited number of projections and does not account for couch and/or MLC movement.
Breast Planning Tips and Tricks
Choosing a Pitch

How to measure target axial offset from the isocenter

10.08 cm
Breast Planning Tips and Tricks

Choosing a Pitch

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Pitch and Beam-On Time
Breast Planning Tips and Tricks

Pitch and Beam-On Time

What pitches will give the shortest beam-on time?

0.215
0.225
0.287
0.297
0.430
0.433

Usually it doesn’t matter!

Beam-on time is largely independent of pitch, and is more dependent upon field width.
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Examples of Different Pitches

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0.430  
**5.8 minutes** total beam-on time  
40-second gantry period

0.433  
**5.78 minutes** total beam-on time  
40-second gantry period
Breast Planning Tips and Tricks
Examples of Different Pitches

| TomoHelical™ 3DCRT | TomoEDGE™ 5cm Dynamic Jaws | VoLO™ Treatment Planning |

5.63 minutes total beam-on time
26-second gantry period

5.65 minutes total beam-on time
27-second gantry period
Breast Planning Tips and Tricks

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0.215

**5.74 minutes** total beam-on time
20-second gantry period

0.225

**5.53 minutes** total beam-on time
20-second gantry period
Breast Planning Tips and Tricks

What If I Don’t Have VoLO™?

• Same great treatment plans, but beamlet calculations require the user to choose the pitch first – choosing a new pitch means calculations must start over.

• However, it is still possible to experiment, without spending a lot of time on extra beamlet calculations:
  › Select a pitch and calculate a few iterations in either Scatter or Terma mode.
  › Then, once the optimal pitch is selected, calculate the plan in Beamlet mode.

- **Terma** does not consider scatter during optimization – *Fast but less accurate.*
- **Scatter** calculates with all scatter – *Slower but more accurate.*
- **Beamlet** Optimization considers scatter but with some approximations—*Accurate, requires longer initial calculation, but optimization is fast.*
TomoDirect™ Breast Planning
Breast Planning Tips and Tricks

Considerations for Planning TomoDirect™ Breast Treatments

• Choosing the best beam angles is critical
• Pitch is per projection and not per rotation
• More beams doesn’t necessarily mean longer treatment time
• Although IMRT is often better, 3DCRT is good too
• Target MUST be within 40cm of isocenter
Breast Planning Tips and Tricks

Setting Beam Angles for TomoDirect™ Breast Treatments

Set medial beam angle so that the medial field edge is as close to the target as possible on entrance and exit. Add flash if desired.

Set lateral beam angle so the medial field edge divergence matches the other field.
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Calculate Dose: Two-Beam 3DCRT Plan

**High Dose**

Consider planning with 4 fields

2.2 minutes total beam-on time
Two-beam 3DCRT plan
Breast Planning Tips and Tricks

Try Adding Beam Angles
Breast Planning Tips and Tricks

Calculate Dose: 4-Beam 3DCRT Plan

High Dose is better

Consider IMRT if still unsatisfactory

2.5 minutes total beam-on time
4-beam 3DCRT plan
Breast Planning Tips and Tricks
IMRT Plan: Slightly Faster, More Conformal

2.4 minutes total beam-on time
4-beam IMRT plan
Normal Tissue Dose Uniformity
Breast Planning Tips and Tricks

What is “Normal Tissue Dose Uniformity”?

• An automated way to improve uniformity of dose Outside of the target, user-selectable on the Planning Station.

• This option may be selected for either TomoHelical™ 3DCRT or TomoDirect™ 3DCRT plans.
Breast Planning Tips and Tricks

What is “Normal Tissue Dose Uniformity”?

• During calculation beamlet compensation is calculated to avoid hotspots outside of target

• Implementation of this option has improved with the 5.X release of the treatment planning software.
Breast Planning Tips and Tricks

Without Normal Tissue Dose Uniformity

High Dose

TomoDirect™ IMRT
TomoEDGE™ 5cm Dynamic Jaws
VoLO™ Treatment Planning
Breast Planning Tips and Tricks

With Normal Tissue Dose Uniformity

No High Dose

TomoDirect™ IMRT
TomoEDGE™
5cm Dynamic Jaws
VoLO™ Treatment Planning
DISCUSSION

TomoTherapy® for Breast Cancer: Realities and Results