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Radiation dose:
when less may be more

	CTDI _{vol} * reduction ¹
FBCT via Airo TruCT	
Adult thoracic 30% (low dose)	72.3%
Adult thoracic 50% (medium dose)	58%
Adult thoracic 100% (high dose)	13.9%
CBCT via O-arm O2	
Chest, med body, low dose (low dose)	69.3%
Chest, med body, standard dose (medium dose)	39.4%
Chest, med body, high dose (high dose)	8.23%

*Computed Tomography Dose Index

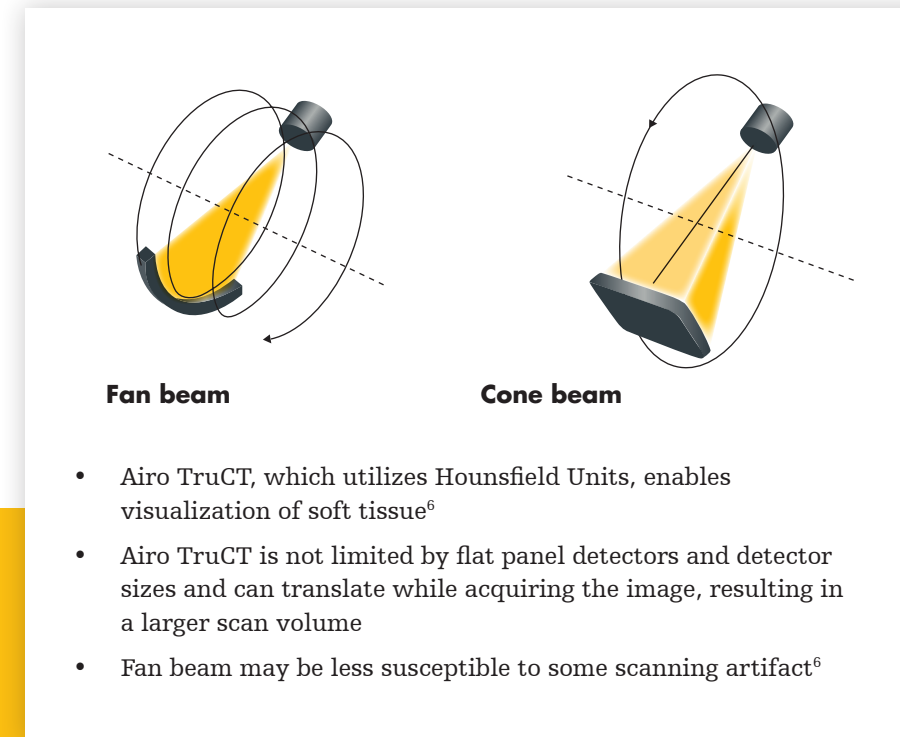
Key findings of the pre-clinical study⁵

- FBCT via Airo TruCT showed greater CTDI_{vol} reduction per tested scanning protocol as compared to CBCT O-arm.
- In the study, reductions in CTDI_{vol} did not show an impact on image quality for FBCT, with FBCT demonstrating significantly improved post-op image quality when compared to CBCT (see chart).
- CBCT required a second radiation exposing pre-operative scan to image desired anatomical region (C1-T4).

Findings of the study may not necessarily be representative of clinical results. Always follow the Airo User manual and accompanying documentation when selecting a scanning protocol.

Airo TruCT vs
O-arm O2:
**Differences
that matter⁵**

It could be thought with CBCT scanners that high-dose radiation provides high-quality images. With Airo TruCT you don't have to compromise. Airo TruCT is designed with dose minimizing features, specified anatomical protocols that can be adapted for patient age and weight, and the ability to customize a protocol depending on the imaging needs of the user.



**Become a fan
of fan beam CT**

To learn more about Airo TruCT, contact your local Spine Enabling Technologies sales representative, visit stryker-virtual-experience.com/spine or write to airosales@stryker.com

References

1. Application Guide Protocols and Principles MI-42-0005 2. Simon S, et al. "CT imaging techniques for describing motions of the cervicothoracic junction and cervical spine during flexion, extension, and cervical traction." *Spine*. 2006; 31(1):44-50. 3. Singh, H. et al. "Novel fluoroscopic technique for localization at cervicothoracic levels." *J Spinal Disord Tech*. 2009; 22(8):615-618. 4. Habib, N. et al. "Use of Intraoperative CT Improves Accuracy of Spinal Navigation During Screw Fixation in Cervico-thoracic Region." *Spine*. (2020) 5. Stryker test report: MI-48-0492 Rev 1 AIRO - Preclinical Imaging Study 2021 6. Lechuga, L. et al. "Cone Beam CT vs. Fan Beam CT: A Comparison of Image Quality and Dose Delivered Between Two Differing CT Imaging Modalities." *Cureus*. (2016)

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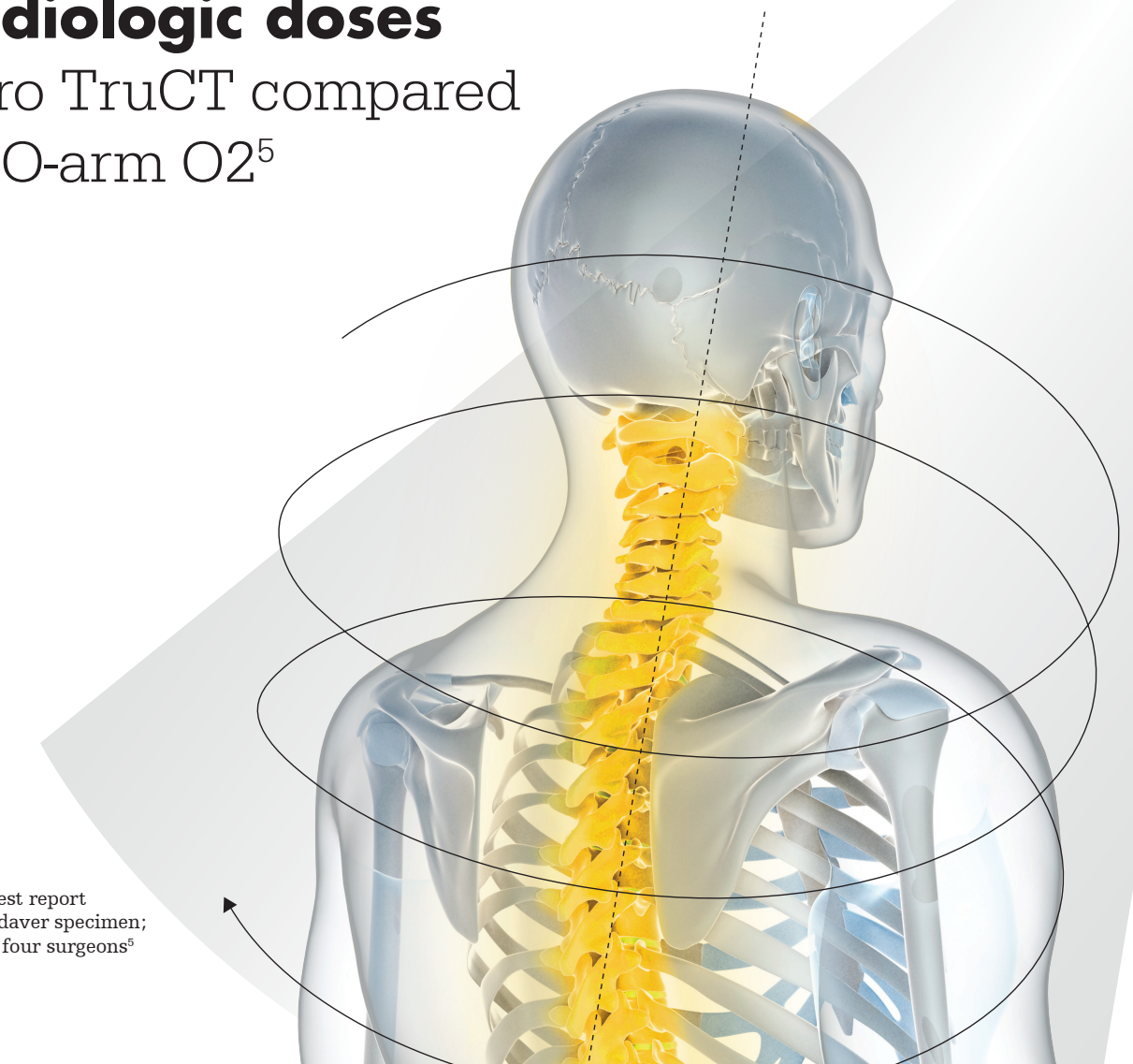
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Advancing CT imaging
of the cervicothoracic junction

**A pre-clinical study
of image quality and
radiologic doses**

Airo TruCT compared
to O-arm O2⁵



Pre-clinical test report
utilizing a cadaver specimen;
evaluated by four surgeons⁵

In this study,
Airo TruCT
compared to O-arm O2⁵:

Up to 30% reduction
in measured CTDI_{vol} values⁵

**"Excellent"
image quality**
at 3x less radiation⁵

~2.5 – 3.5 x less
cumulative scatter dose⁵

Pre-clinical test report utilizing a cadaver specimen; evaluated by four surgeons⁵

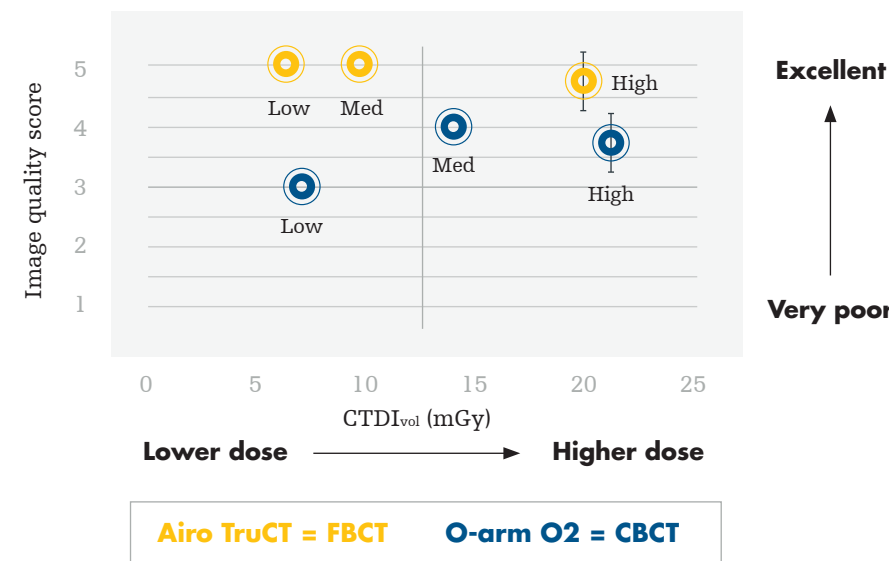
Cervicothoracic imaging insights

Imaging at the cervicothoracic junction can be challenged by the presence of the bony and soft tissue of the shoulders, scapulae, and clavicles, and may be further exacerbated under conditions of excessive soft tissue.²⁻⁵ To help determine which imaging technology may be best to tackle this task, a comparative study of a fan beam CT (Airo TruCT) and a cone beam CT (Medtronic's O-arm O2) was conducted using a cadaveric specimen reflective of these complexities. **Here's a look at how fan beam technology via Airo TruCT may offer you some advantages over O-arm O2.**

Imagine the best of both worlds:

Higher image quality and lower radiation than O-arm O2⁵

Post-op image quality and CTDI_{vol} – across all protocols



▲ Trends for both platforms showed image quality evaluation was not largely influenced by dose protocol utilized, whereas the platform itself had a more significant impact on image quality scoring.



100% "excellent" cervicothoracic image quality

for post-op scans with Airo TruCT at all dose protocols⁵

Pre-clinical test report utilizing a cadaver specimen; evaluated by four surgeons⁵



An evaluation encompassing all data points for image quality and radiation dose showed FBCT via Airo TruCT outscored CBCT via Medtronic's O-arm O2 in multiple categories, providing significant improvements in cervicothoracic image quality at lower calculated CTDI_{vol}.⁵

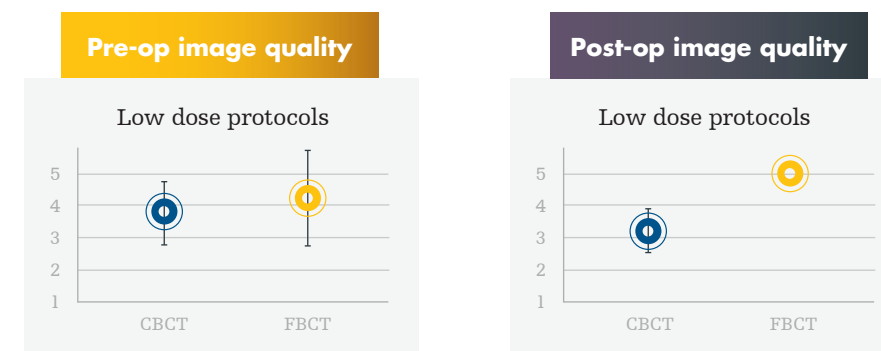
All doses: key findings of the study⁵

- FBCT image quality was significantly improved versus CBCT both pre- and post-operatively, with low, medium and high dose imaging rated as "excellent" quality.
- CBCT image quality was rated lower ("good" or "acceptable") in multiple categories, although radiation was higher at all doses.
- Two of three CBCT measurements fell outside the optimal quadrant which was defined as high image quality, paired with low radiation dose.
- Pre-operatively, FBCT's "excellent" image quality supports planning and surgical navigation/execution.
- Low-dose FBCT (6.4mGy) enabled a three-fold reduction from high-dose CBCT (21.2 mGy) while still achieving "excellent" image quality, helping combat conventional thought that high doses may not always be required to capture high-quality images.

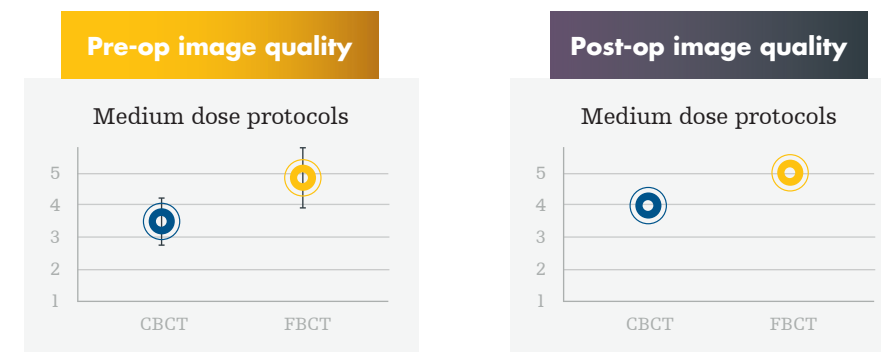
Airo TruCT: Cutting edge quality⁵

FBCT and CBCT pre and post-op image quality was directly compared at low, medium and high dose imaging protocols.

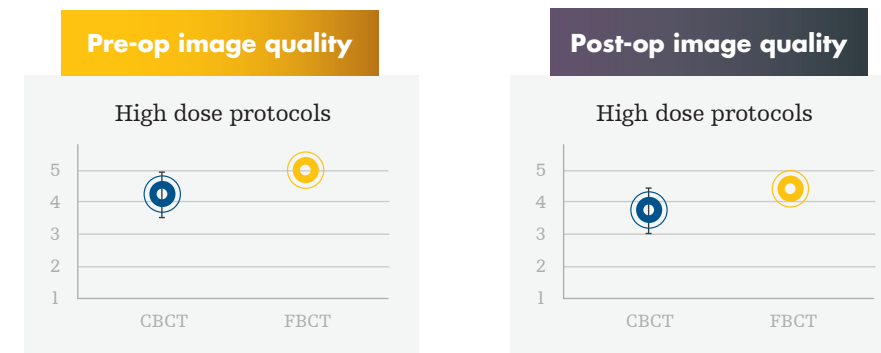
Low-dose image quality



Medium-dose image quality



High-dose image quality



Key findings⁵

- FBCT pre-op image quality was superior to CBCT for all protocols with statistical significance for medium and high-dose protocols
- FBCT post-op image quality was statistically superior to CBCT for all protocols
- High dose CBCT image quality was rated lower than the low dose FBCT image quality.
- FBCT was rated as "excellent" by all surgeons in the study, in both pre and post-op image quality studies, while CBCT only received one "excellent" rating.

▲ Based on a modified Likert scale⁶ of 5 = Excellent, 4 = Good, 3 = Acceptable, 2 = Suboptimal, 1 = Very poor.

Airo TruCT's modulation and automatic weight adaption features were not utilized to reduce bias, as this feature was not available on the other platform.

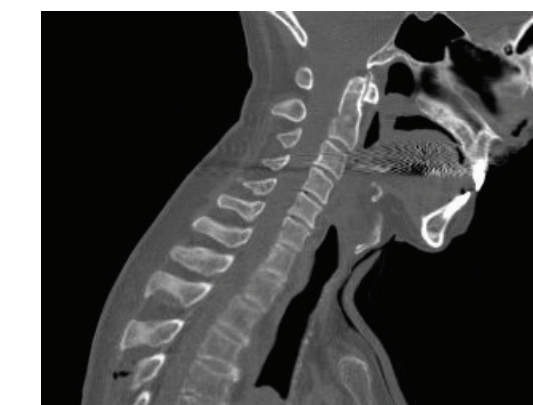
This study shows

Airo TruCT outperformed O-arm O2 by delivering⁵

- "Excellent" image quality
- Lower radiation
- Greater scan volume

Airo TruCT workflow benefits

- Airo TruCT imaging area of 1m length x 51.2cm width enables C1-T4 capture **in one scan**
- Potentially helps save operating room time and effort over CBCT by eliminating need for multiple scans, repositioning patient/table and creating image overlays/stitching



Airo TruCT - high dose

O-arm O2, high dose, ~C1-C6 single acquisition scan length

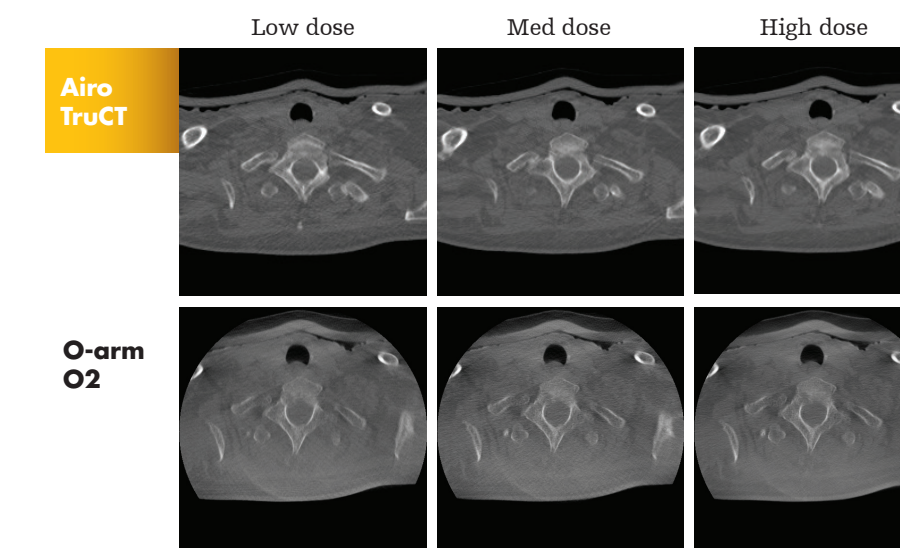


O-arm O2, high dose, image overlay of first and second scans



▲ Airo TruCT easily captures C1-T4 within its 1m scan capabilities. All without the need of stitching multiple scans together.

"Excellent" image quality⁵



▲ Data shows FBCT consistently generated "excellent" image quality per dose protocol, as reflected in these pre-op axial images at the T1 level.⁵

Pre-clinical test report utilizing a cadaver specimen; evaluated by four surgeons⁵

Study parameters

Objective

- Evaluate image quality
- Quantify radiation dose

Imaging equipment

- Cone beam CT via Medtronic's O-arm O2
- Fan beam CT via Stryker's Airo TruCT

Area of interest

- C3-T3 within C1-T4 scans
- Scanned at low, medium and high doses per vendor protocols
- Captured pre- and post-operatively (posterior screws implanted bilaterally C3-T3)

Cadaveric specimen

- 6', obese (34 BMI), 73 yr male
- Uneviscerated, unembalmed with torso intact (arms in field of view)

Image quality evaluation

- Blinded images (labels, dose and branding removed) rated by surgeons via Likert scale
- Evaluated by four ortho and neuro spine surgeons

Radiation dose quantification

- Measured dose to the patient and scatter 6' from scanner isocenter via CT imaging phantom
- Oversight and analysis by Versant Medical Physics and Radiation Safety