

Evaluation of Correlation Objects for kV-based Lung Tumor Gating

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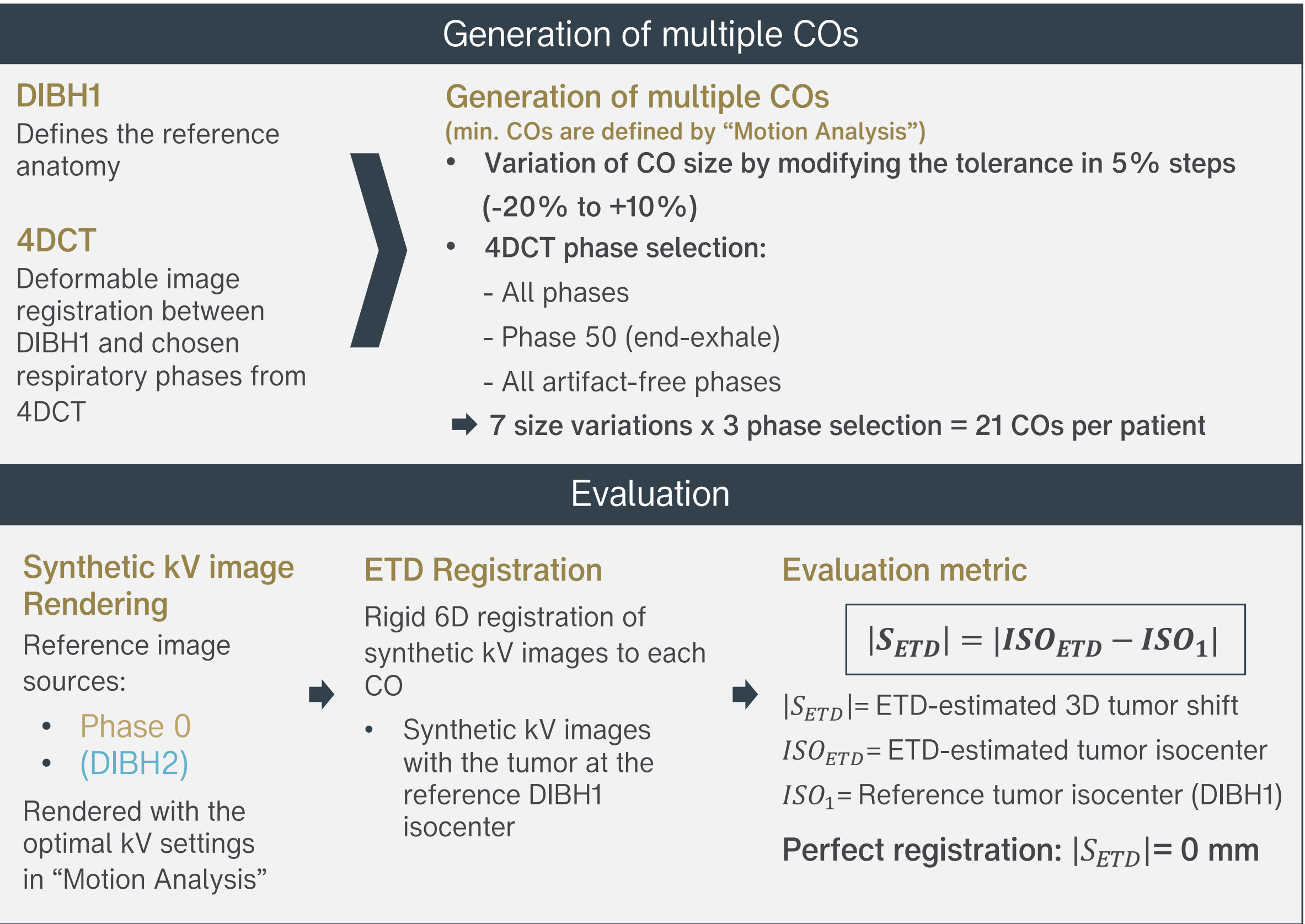
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Purpose

Since direct lung tumor visualization during treatment is often limited, ExacTrac Dynamic (ETD) enables indirect tumor localization by registering stereoscopic kV images to patient-specific CT-based correlation objects (COs). This study evaluated the impact of **CO configurations (size and respiratory phase selection)** as well as **reference kV image selection** on registration accuracy.

Materials and Methods

12 patients (13 tumors) with 4DCT and DIBH1 (deep-inspiration breath-hold CT) including seven patients with an additional DIBH (DIBH2) acquired on the same day as DIBH1.



Results

Table 1: Summary of CO size associated with the lowest median $|S_{ETD}|$ and comparison of respiratory phase selection for phase 0 and DIBH2 reference kV images.

Analysis		Phase 0 kV images			DIBH2 kV images		
CO size (all phase selections)	Optimal tolerance	-10%			-15%		
	Median (range) of $ S_{ETD} $ in mm	3.9 (1.3–11.3)			0.9 (0.4–1.6)		
CO phase selection (-10% tolerance)	Phase selection	All phases	Phase 50	All artifact-free phases	All phases	Phase 50	All artifact-free phases
	Median (range) of $ S_{ETD} $ in mm	4.0 (1.3–9.9)	3.9 (2.2–11.3)	3.9 (1.7–9.9)	0.9 (0.6–1.6)	1.0 (0.4–1.6)	1.0 (0.8–1.6)

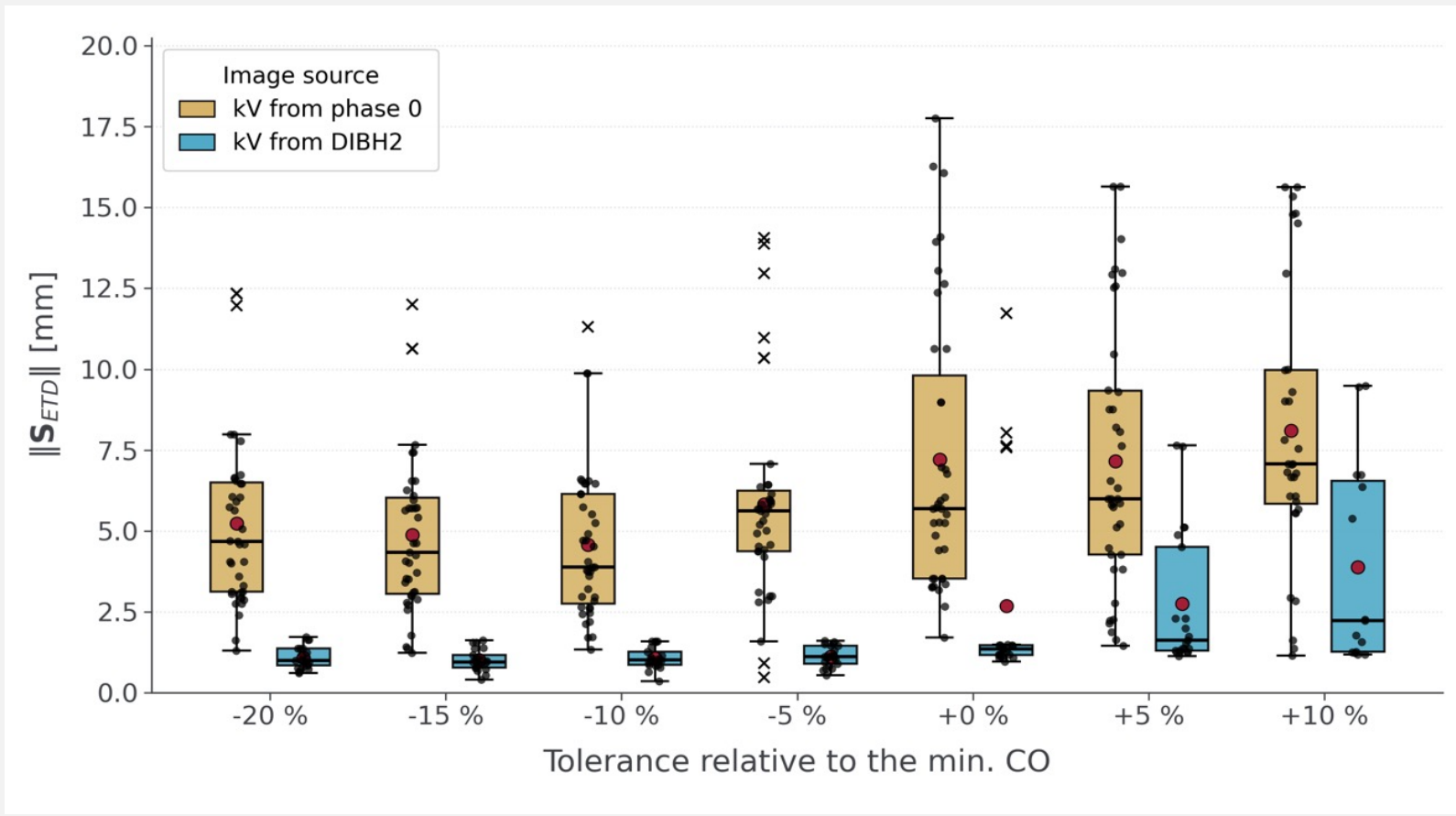


Figure 1: Distribution of $|S_{ETD}|$ for different CO sizes using phase 0 and DIBH2 kV images. Lower tolerance corresponds to larger COs.

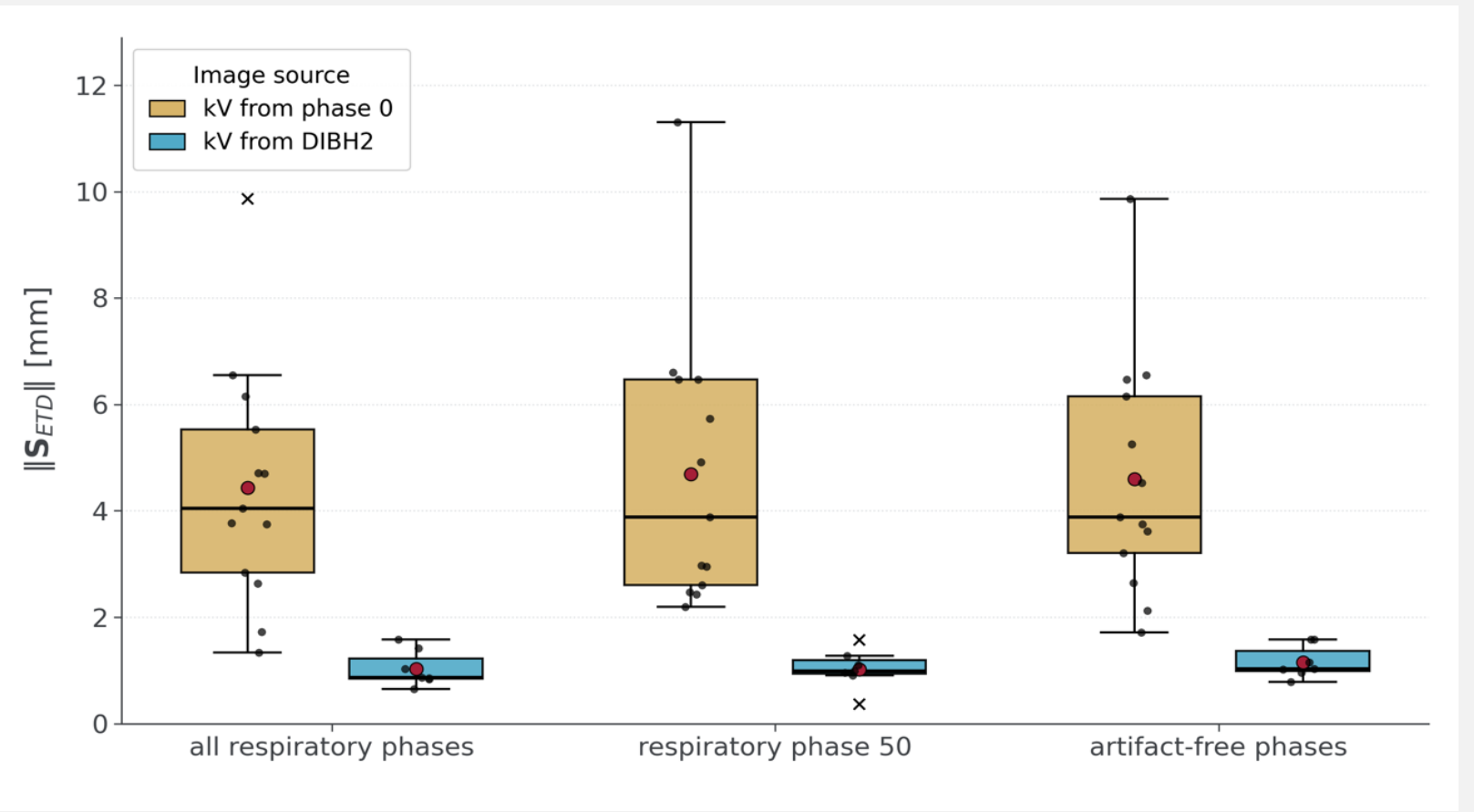


Figure 2: Distribution of $|S_{ETD}|$ for different respiratory phase selections using phase 0 and DIBH2 kV images at a fixed CO tolerance of -10%.

Conclusion

ETD registration accuracy was mainly influenced by CO size and reference image source of kV images, while the respiratory phase selection had only minor influence. Future work will investigate the influence of tumor localization and respiratory motion on ETD registration accuracy.

Conflict of Interest

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