

# Phantom CT: 3 Window<sup>1</sup>

2 . . . . . 3

CT , window phantom 5cc  
Phantom CT[collimation(mm)/table speed(mm/sec): 3/3,  
reconstruction interval:1.5mm] . 3 window (  
: -1000HU, : -300HU -500HU 50HU )  
phantom 12.55mm  $\pm$  3.19  
window 3 가  
window 가 (p<0.0001).  
500HU window 가 가  
CT -500HU window  
가  
CT - 3 가 phantom  
tom CT (Fig. 1).  
Picker 2000(Piker International, Ohio,U.S.) ,  
130 kVp, 150 mA collimation: 3 mm, pitch: 1,  
(reconstruction interval): 1.5 mm, matrix size: 512  
 $\times$  512, pixel size: 0.59  $\times$  0.59 mm, FOV: 300 mm  
. Work station(Voxel Q; Piker Interna-tional, Ohio, U.S.)  
SSD(Shaded Surface Display) 3  
가  
(3) 가  
phantom (gradient) (contrast) 50 . 3  
window (minimal threshold  
value) -1000HU , (maximal threshold  
value) -300HU -500HU 50HU ,  
(Fig. 2).  
5cc ( 가 5  
(  
)  
Venier  
caliper (Mitutoyo co., Japan)  
0.05 mm (Table 1). SAS  
(multiple linear regression  
test) 2 (two way ANOVA)

Phantom CT

(con- (Table 1). , ,

trols) window 가 R-square 0.6064, p< 0.0001 .

(%) =  $12.7840 + (0.819 \times \text{window}) + (0.0343 \times \text{window}^2)$

- phantom window 3 2 window

12.55 mm  $\pm$  3.19 가 가 (interaction) (p<0.0001). ,

window 가 가 window 가

Table 1. Control and Measured Values of Inner Diameter at Varying Angles and Windows

Angle ( $^{\circ}$ )	Control (mm)	Inner Diameter at varying Maximal HU				
		-300HU	-350HU	-400HU	-450HU	-500HU
-95	12.55	14.5	14.2	13.9	13	12.5
-89	12.55	14.5	14.1	13.3	12.6	12.5
-80	12.60	14.1	13.9	13.4	12.6	12.6
-63	12.50	13.7	13.2	12.9	12.6	12.5
-55	12.55	13.8	13.2	12.5	12.5	12.4
-47	12.55	13.2	12.9	12.8	12.6	12.5
-39	12.60	13.4	12.7	12.6	12.6	12.5
-32	12.60	12.9	12.7	12.6	12.6	12.5
-22	12.55	12.7	12.6	12.5	12.5	12.4
-14	12.55	12.9	12.8	12.6	12.5	12.3
-7	12.55	12.7	12.6	12.5	12.4	12.4
0	12.50	12.7	12.5	12.5	12.4	12.3
7	12.55	12.6	12.5	12.5	12.4	12.3
14	12.55	12.9	12.6	12.6	12.5	12.3
23	12.55	13	12.7	12.5	12.5	12.4
32	12.55	12.9	12.5	12.5	12.4	12.4
39	12.50	12.9	12.6	12.5	12.4	12.4
49	12.50	13.1	12.7	12.5	12.4	12.4
58	12.55	13.4	13.0	12.6	12.5	12.5
64	12.55	13.9	13.3	12.5	12.5	12.5
74	12.55	14	13.6	12.7	12.5	12.5
83	12.60	14.3	14.2	13.3	12.6	12.5
92	12.60	14.7	14.1	13.5	12.9	12.5

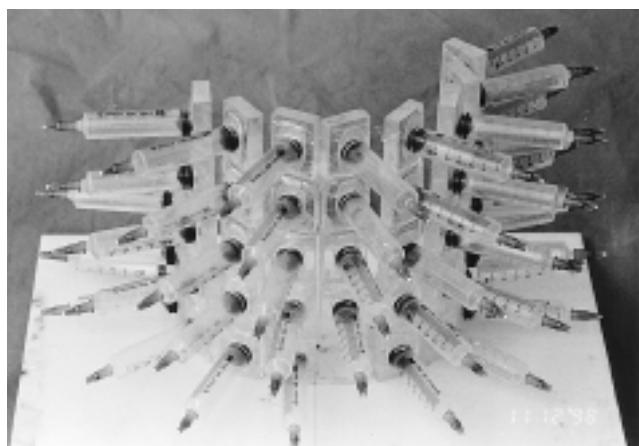


Fig. 1. The Bronchial Phantom consisting of Air-filled Syringes Oriented in Varying Angles Relative to the Scan Plan

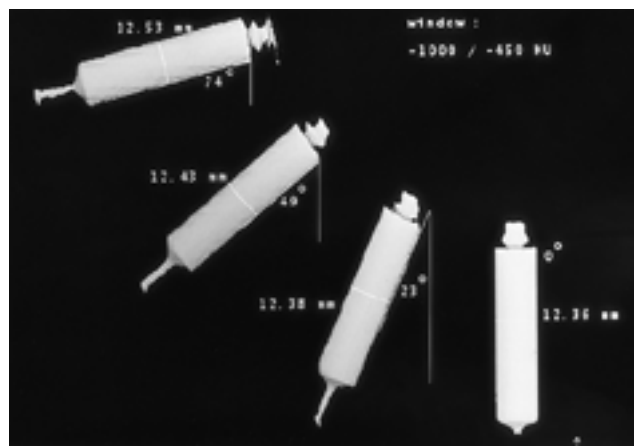


Fig. 2. The 3D Image of Bronchial Phantom : Air-filled Syringes Oriented in Varying Angles ( Window: Minimal -1000HU, Maximal -450HU)

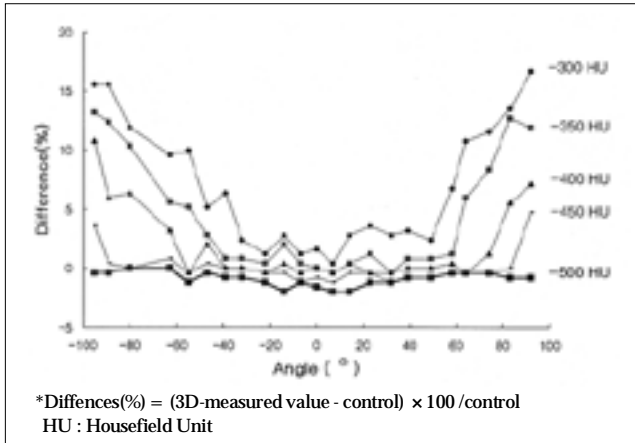


Fig. 3. \*Differences at varying angles show the closest value to real size at the maximal HU of -500.

가 , window 가  
가  
-500HU win-  
dow 가 (Fig. 3).  
가  
CT 가 . 2  
window center control Koehler (4) window width  
partial volume effect  
Webb(5) window  
window  
window level  
-450HU -600HU ,  
-150HU 가  
window level  
, collimation  
collimation -150HU window 1cm  
가 30  
0.15 0.5cm collimation  
2 collimation 가  
partial volume effect  
CT 0.3cm collimation  
collimation  
가

가 (1,2,3,6). window level  
, collimation  
CT  
Section sensitivity profile interpolation, pitch,  
(slice thickness), (7). Hans  
(8) CT 3  
가가  
(stairstep & transaxial cut off artifact)  
. William  
(9) 1mm collimation  
pitch 2 3mm collimation  
collimation 가  
pitch  
3- 5 mm collimation pitch  
1- 1.5 . Schaefer (10) 3  
가 -650HU -750HU  
, window가  
. William (9) SSD 3  
가 SSD  
voxel  
air casting  
(11)  
partial volume effect 가 voxel value  
(12,13).  
partial volume effect가 , (threshold  
value)  
(14,15). Adrew(16) SSD  
1000HU -500HU -300HU  
window  
-500HU -300HU  
window - 3  
(3) -1000HU  
가 -450HU -  
550HU , -500HU -600HU 가  
가  
가  
window  
(Table 1).  
window  
가  
가 -1000

-500HU window partial volume effect  
window  
가 Phantom  
가  
Webb(5) - 가  
phantom CT  
3  
partial volume  
mation pitch window colli-  
- 3 CT  
dow window 가 win-  
window 가

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3. , , , , , , , . CT

- : - Phantom CT  
Window  
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## Helical CT of a Tracheobronchial Phantom: Angle and Optimal Window Affecting Size Measurements of Three Dimensional Images<sup>1</sup>

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**Purpose:** To determine the effect of angle variation, relative to scan plan and optimal window setting, on the size of three dimensional spiral CT images of a tracheobronchial tree using a phantom.

**Materials and Methods:** Spiral CT [collimation(mm)/table speed(mm/sec): 3/3; reconstruction interval: 1.5 mm] was performed on a tracheobronchial phantom consisting of a box filled with saline solution containing air-filled 5cc syringes oriented at varying angles relative to the scan plan. The diameter of three dimensional images was measured at each window (minimal threshold value; -1000 HU; maximal threshold value: from -300 HU to -500 HU; 50 HU interval).

**Results:** The inner diameter of syringes used for tracheobronchial phantom was  $12.55 \pm 3.19$  mm. At all windows, as the angle became more perpendicular, the diameter of three-dimensional images increased, and at all angles, as maximal HU increased, measured diameter also increased ( $P < 0.0001$ ). In particular, at a maximal value of -500 HU, measured values were closest to control values at all angles.

**Conclusion:** Diameter can be measured close to control value from three dimensional spiral CT images at maximal HU of -500 window, regardless of angle.

**Index words:** Trachea, CT  
Bronchi, CT  
Computed tomography(CT), three-dimensional

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