Purpose: To investigate the effect of the helical pitch, patient size, and beam width on point dose measurements of superficial organs in MSCT.

Methods: Three sizes of cylindrical PMMA phantoms were utilized; 32cm (body), 16cm (adult head), and 10cm (pediatric head). For each phantom, helical scans were performed with different pitch factors (0.7, 1.0, and 1.3) and collimations (12mm and 24mm). In each scan, a strip of gafchromic film, measuring 12x1.5cm2, was taped onto the top of the phantom along its z-axis. Film strips were scanned, red channel was extracted and pixel values were converted into optical densities from which doses (mGy) were obtained using a calibration curve.

Results: The periodic pattern of peaks and valleys in dose profiles along the z-axis of phantom surface was more obvious with the body phantom; the highest variation (% difference between peak and valley) was 56%. Adult and pediatric head phantoms showed significantly less variation; highest = 30% and 24%, respectively. These values were found with pitch 1.3 and collimation 24mm. When collimation was changed from 12mm to 24mm, the amount of variation was nearly doubled (at pitch 0.7 and 1.3). With pitch 1, dose variation was different; in the pediatric phantom the variation was similar in either collimation (7%). In adult and pediatric head phantoms it increased from 6% to 9% and from 17% to 39%, respectively.

Conclusions: If point dose measurements were to be taken on patient surface or for superficial organs such as breast or thyroid using small dosimeters in anthropomorphic phantoms, the combined effect of helical pitch, patient size, and collimation on dose assessment accuracy should be taken into consideration. Variation of about 60% may result with large patients, high pitch, and wide collimation. Variations will be largely reduced with smaller patients, pitch close to 1 and narrow collimation.