Retrospective analysis of the anatomical relationship of the umbilicus and aortic bifurcation in Australian adult females.

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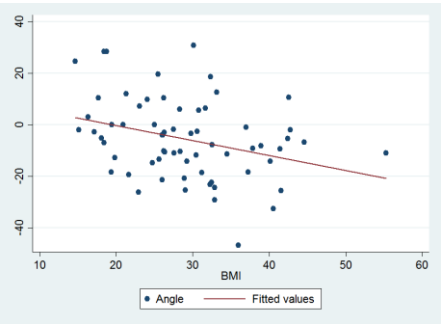
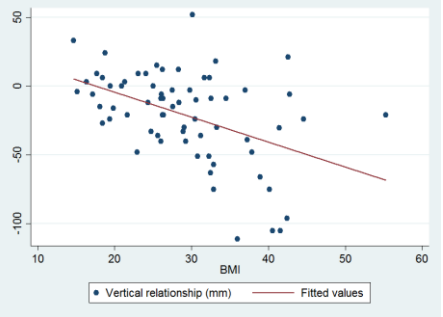
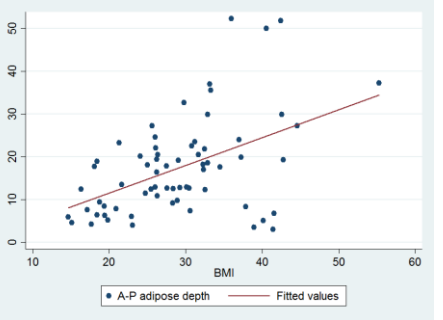
Objective: Evaluate the anatomical position of the umbilicus relative to the aortic bifurcation in Australian women and the relationship with body mass index.Prior studies[1,2] have shown relationships between age and BMI with the caudal distance between the umbilicus and aortic bifurcation. In the largest study[2] 97.7% of women had a BMI <30. This provides limited clinical utility to the care of 27.4% of adult Australian women with a BMI >30.







118 cases of Abdominal CT were identified from the records of a tertiary hospital. All women had undergone CT abdomen +/- pelvis for a variety of indications in the supine position. Women were excluded if they did not have BMI data recorded within 3 months of the CT; <18 years old; or had findings on CT that could distort the anatomical relationship. 50 cases were excluded, the remaining 68 studies were reviewed, and measurements were collected. Vertical relationship was positive where the umbilicus was cranial to the aortic bifurcation. All images were assessed by a single clinician. Any concerns about anatomical distortion were referred to a senior radiologist for expert opinion. All measurements were taken using the method described in previous studies[2]. Results were considered significant with p value < 0.05. A linear regression analysis was used to individually investigate the outcome variables of vertical distance, adipose depth and angle of bifurcation from umbilicus; with BMI.

Results: The umbilicus was located caudal to the aortic bifurcation in 70.59% of the studied population. The mean age was 68.8 (SD 14.26), and the mean BMI was 28.7 (SD 7.89). 11.25% were underweight (BMI <18.5), 18.75%, 30% were overweight (BMI 25-29.9), and 40% were obese (BMI >30). There was a significant negative relationship between BMI and the umbilicus position in relation to aortic bifurcation (coeff -1.81; CI 95% -2.68 to -0.93; p <0.001). There was a significant negative relationship between BMI and the angle from the umbilicus to the aortic bifurcation (coeff -0.58; CI 95% -1.02 to -0.14; p <0.01). There was a significant positive relationship between BMI and adipose depth (coeff 0.65; CI 95% 0.35 to 0.95; p <0.001).

Conclusion: Increasing BMI has significant negative relationships of the angle and distance of the umbilicus to the aortic bifurcation, and a significant positive relationship in the distance to the peritoneum. These are considerations relevant to the use of the umbilicus for primary access for laparoscopic surgery and to minimise the risk of major vessel injury. Despite these significant relationships, the confidence intervals suggest that ongoing caution is required due the wide variation of results, particularly in obese patients. A further study of additional cases will aim to narrow the confidence intervals.

1)Hurd WW, Bude RO, De Lancey JOL, Pearl ML (1992) The relationship of the umbilicus to the aortic bifurcation: implications for laparoscopic technique. Obstet Gynecol 80:48–51
2)Jeong JY, Kim YR, Kim JY, Jee BC, Kim SH (2014) Vertical distance between umbilicus to aortic bifurcation on coronal view in Korean women. Obstet Gynecol Sci. 57(1):44–49
3)Australian Bureau of Statistics, National Health Survey: First Results, 2014-2015