

Redefining Staple Loading Pressures for Adequate Tissue Apposition in Laparoscopic Sleeve Gastrectomy

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Introduction: Stomach tissue thickness (TT) is an important factor in forming an adequate staple line in laparoscopic sleeve gastrectomy (LSG). TT and surgeon-selected closed staple height (CSH) determine the pressure applied to the tissue. Staples need to have a CSH that is appropriate for TT in order to avoid staple malformation or undercompression, leading to leaks or bleeding. To mimic stapling conditions, prior studies to characterize compressed stomach TT have used a loading pressure of 8g/mm². The purpose of this project is to investigate the pressure applied to achieve CSH in LSG, which has implications on TT measurement and surgeon cartridge selection.

Hypothesis: We hypothesize that 8g/mm² is an inadequate loading pressure for measuring stomach TT.

Methods: Freshly excised stomach specimens from 33 patients between the ages 18 and 75 undergoing LSG performed by two surgeons at West Chester Hospital between July 10 and August 11, 2017 were included. Staple line length, cartridge zone locations, and tissue thickness at sequential pressures were recorded. Median pressure to achieve CSH was derived and tissue thickness maps at 8g/mm² and at the median pressure were compared.

Results: Median pressure to achieve closed staple height was 16g/mm². The new tissue thickness map at 16g/mm² produced mean TT of 1.9mm at the antrum, 1.7mm at the body, and 1.2mm at the fundus. Tissue thickness at each of the 26 locations along the staple line were significantly smaller at a pressure of 16g/mm² when compared to at 8g/mm².

Conclusions: The median pressure required to compress stomach tissue to obtain CSH was 16g/mm². This is significantly greater than the previously reported data. Our results indicate that the use of smaller staple heights is biomechanically acceptable in LSG and a higher loading pressure should be used when developing new stapling devices.

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