Quantitative Analysis of Small Intestinal Length Using Radiologic Images

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Background

Short Bowel Syndrome (SBS) is characterized by the functional or anatomic loss of extensive segments of small bowel, resulting in massive reduction of the absorptive capacity. The major correlate to patient survival is the length of remaining bowel. Currently, no conventional method exists by which remaining bowel length can be accurately measured. Our goal was to use a mouse model, utilizing computerized tomography scanning, to determine bowel length *in situ*.

Methods

Mice were fed a 1:1 dilution of water-soluble contrast in liquid food for 90 minutes following ad lib water only overnight. Under general anesthesia, CT scans were performed on unoperated mice. Small bowel was harvested from pylorus to cecum; *in vivo* length was measured using the laboratory's established length standardization protocol. Small bowel length was measured *in situ* using CT images created on a Vitrea workstation. *In situ* measurements were correlated with *in vivo* lengths.

Results

Comparing length measurements obtained via harvest and radiologic imaging, a R^2 of 0.847 was achieved with an n=6. There is a trend of bowel measurements approaching acceptable correlation values between *in vivo* and *in situ* environments.

Discussion

Measuring bowel length *in situ* was a challenge likely heightened by the limitations of current commercial computer software; convolutions of the bowel created the dilemma of measuring segments within repeated image slices that were unable to be properly interpreted by the software. Therefore, the current CT measurements are more of an approximation than a specific length. However, the utility of a system like this is still very high. Future work will include increased proficiency with the software, and refining the methods by which the bowel is measured. Improving our ability to provide accurate *in situ* measurements will be widely applicable to the SBS population and allow exceedingly improved long-term patient management and surgical decision-making.