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学位論文題名 (注: 学位論文題名が英語の場合は和訳をつけること)

Small bowel motility function: assessment using MR imaging

(小腸の運動機能: MRI を用いた評価)

学位の種類: 博士 (放射線学)

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Purpose

The purpose of this thesis is to demonstrate the result of our current research regarding automatic assessment of bowel motility function and to overview the anatomy and functional physiology of the small bowel, as well as imaging studies for diagnosing bowel diseases. The purpose of our current research is to evaluate a potential of newly developed automatic computerized method for quantitative assessment of bowel motility function using super-pixel segmental technique.

Materials and Methods in our current research

Sixteen series of cine-MR imaging is performed with breath holding using Steady-state free precession sequence after the oral intake of 1500mL of non-absorbable fluid. Then one ROI is set to include an interested bowel segment in each series and the temporal area changes of the bowel segment are monitored. In the gold standard method, area measurements are performed by tracing the borders of the interested bowel segments by hand, while in our proposing method, the borders of the interested bowel segments are traced using super-pixel segmental method. Then the bowel contraction frequencies are calculated from the temporal area change curves with Fourier transformation. Results from the two methods are compared regarding the correlation of the two temporal area change curves, the correlation of the two frequency curves, and the difference in estimated contraction frequencies.

Results

The mean correlation coefficient between the two temporal area change curves was 0.67 with the standard deviation of 0.14. The mean correlation coefficient between the two frequency curves was 0.80 with the standard deviation of 0.13 for the all frequencies and 0.82 with the standard deviation of 0.12 for the first frequency components. Regarding the estimated

contraction frequency, the mean value of the proposed method was $0.10 \pm 0.02\text{Hz}$ and the rate of the absolute concordance with the gold standard method was 56.3%. There was little difference existed; the mean difference between the two methods was 0.02Hz with the standard deviation of 0.03Hz.

Conclusions

The current study has demonstrated the feasibility of super-pixel segmental method to automatically select the interested bowel segments in the presetting ROIs and to provide the temporal trend of bowel contractions which estimates their contraction frequencies. The potential of our currently proposing method was indicated for computerized automatic quantitative assessment of the bowl motility function.