Table 2. Comparison of the conformity ratios.

b	Statistical standard	30 min after postural change	Stationary EGG
1	68.3%	54.8%	57.1%
2	95.5%	95.2%	100%

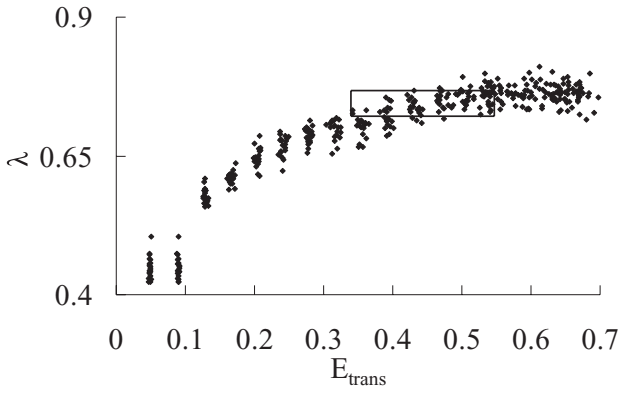

Fig. 16. Simulation results for the $E_{\text{trans}} - \lambda$ plane. The rectangular region shows $\Re_s^2$ for $b = 2$.

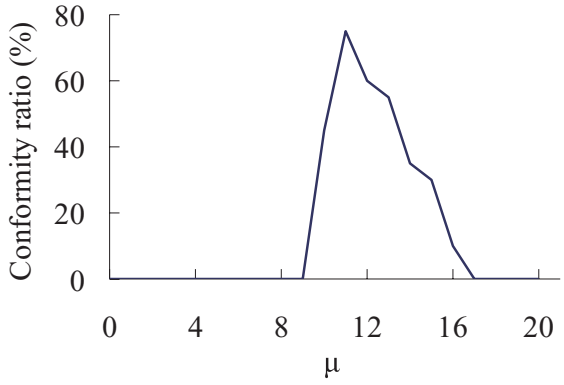

Fig. 17. Conformity ratio for $\mu = 1, 2, \ldots, 20$.

nations. If EGG is carried out before these modalities to select patients requiring these examinations or as a disease-specific examination, it is considered to not only reduce the patients' burden, but may also be incorporated in health-checking instruments and applied to medical services for remote areas. To achieve this, the accumulation of basic research, development of more precise analytical methods, and establishment of the evaluation method are needed.

EGG is a measurement technology that has not been applied to the diagnosis of gastrointestinal disorders or medical engineering, but shows considerable potential for future application and development. Constipation and FD have been treated primarily with drugs, but the clinical application of EGG to the treatment of these conditions and the development of products using EGG are considered to contribute to the early diagnosis and treatment of diseases based on abnormalities of gastrointestinal activities. Because of the simplicity of the EGG procedure, the burden of examination will also be reduced. Also, the development of measurement and health-check instruments incorporating EGG will promote new attempts at its application.

To advance research using EGG, it is important to accumulate data by performing studies on the gastric motor function in patients with various gastrointestinal disorders before and after surgery and in patients with FD before and after drug treatment, as well as studies on qualitative diagnosis by the multi-channel mapping of lesions of gastrointestinal dyskinesia and their changes over time. Developing the procedure and evaluation criteria of EGG as a noninvasive objective examination to make it clinically applicable and using it for the treatment of constipation and diarrhea are also of benefit to epidemiology. Also, the availability of a simple examination such as EGG reduces the physical burden to patients. Further, EGG can be made self-administrable, and the data can be made self-assessable using simple criteria, to the advantage of daily health management.

6. Conclusions

EGG is a technique to measure gastrointestinal electrical activities, which cannot be detected by other examinations of gastrointestinal motility. It is also useful as an examination of the autonomic function controlling gastrointestinal activities.

In the future, aging of the population is expected to advance further in Western countries as well as in Japan. Electrical activities of the gastrointestinal tract reportedly decrease with aging. An adequate diet is indispensable for elderly people to maintain or improve their Quality of life (QOL), and, for this purpose, the maintenance or improvement of the gastrointestinal motor function is important. EGG can be performed safely and easily even in elderly people. Diagnosis or evaluation using EGG is considered to promote not only the preservation or improvement of the gastrointestinal motor function, but also the clarification of biological mechanisms and the development of diagnostic and preventive measures for gastrointestinal disorders. EGG is still in the developmental stage, but will continue to be developed and become applied widely in the future.

Appendix A.

The Wayland algorithm was used to evaluate the determinism of a time series. The conventional methods for estimating the determinism of a time series are the Grassberger-Procaccia algorithm, run-test, and so on. The Wayland algorithm is superior to these other methods because of the following characteristics. It does not need a very large amount of data. It is robust to noise. There is no restriction in relation to the dimensions of the attractor estimated by Wayland algorithm.

In a case where stochastic factors were added to the time