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Is the accuracy of isotope-selective non-dispersive infrared spectrometry (NDIRS) sufficient for determination of gastric emptying using the ¹³C-octanoic acid breath test (¹³C-OABT): Comparison with isotope-ratio mass spectrometry (IRMS)

Background: The ¹³C-OABT is a non-invasive simple and reliable tool for determination of gastric emptying. Analysis of breath samples for determination of the ¹³C/¹²C-ratio requires highly accurate detection methods. Therefore IRMS is most frequently used and up to now only one study has compared the accuracy of a less expensive NDIRS system (Clin Chem. 1997; 43: 518-22) for determination of gastric emptying. Aim of our study was to confirm the previous findings using another NDIRS system for evaluation of gastric emptying by the ¹³C-OABT compared to IRMS.

Methods: A total of 35 subjects (18m, 17f, age 23-68y) with dyspeptic symptoms were studied. A ¹³C-OABT was performed after an overnight fast by giving a test meal consisting on 50 g white bread, 10 g butter, 50 g cooked ham, 200 ml orange juice and an one-egg omelette containing 91 mg ¹³C-octanoic acid in the yolk. Breath samples were collected at 15 min intervals for a 4 hour period using 10ml glass tubes (for IRMS) and breath samples bags (for NDIRS). Breath samples were analyzed either by IRMS (ABCA-system, PDZ-Europa, Crewe, UK) and by NDIRS (FANci2, FAN Ltd., Leipzig, Germany). Lag phase and gastric half emptying time (t_{1/2}) were calculated by non-linear regression analysis. Based on the European validation a gastric emptying time up to 120 min is considered as normal.

Results: A reasonable linear correlation of gastric emptying parameters was found between the two methods (t_{1/2}: $y = 1.02 x - 2.2$, $r^2=0.918$; lag phase: $y = 1.04 x + 2.0$, $r^2=0.924$). In only one case a discordant result was observed after categorisation in normal and abnormal gastric emptying.

Conclusion: The accuracy of the tested NDIRS-system for determination of gastric emptying is convincing. Because of the easy handling, the lower purchase price, and the proven accuracy, the NDIRS is a useful alternative to IRMS not only for ¹³C-UBT, what has frequently been proven, as also for ¹³C-OABT.