Pediatric gastroesophageal reflux and upper gastrointestinal tract motility: the use of multichannel intraluminal impedance and high resolution manometry
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OUTLINE OF THE THESIS

In this thesis, multichannel intraluminal impedance (MII) and high resolution manometry (HRM) are discussed as novel means of studying pharyngeal and esophageal function, especially in the (patho)physiology of gastroesophageal reflux (disease). In Part I - Optimization of the multichannel intraluminal impedance technique, studies are presented that attribute to optimization of MII analysis and interpretation. Part II – Physiological studies focuses on the development of pharyngeal swallowing mechanisms and (patho)physiology of GER (disease), using MII and HRM. Part III – Complex forms of esophageal motility disorders comprises of a study where MII in combination with manometry was used to elicit complex esophageal function abnormalities in patients with esophageal atresia.

PART I – OPTIMIZATION THE MULTICHANNEL INTRALUMINAL IMPEDANCE TECHNIQUE

Although 24 hour combined MII / pH monitoring has some clear advantages over 24 hour pH monitoring alone, it is a developing technique and therefore requires further optimization. The detection of liquid boluses by MII has now been validated. However, it has been shown that gas GER can attribute significantly to symptom generation and validation of gas GER was only performed in vitro and sedated cats. Chapter 1 describes MII patterns associated with known gas GER episodes in humans and evaluates factors influencing the magnitude and patterning of impedance changes during such episodes.

Another problem with interpreting MII results is defining a temporal association between symptoms and GER events. In theory, such an association would be a convincing way of showing that GER in specific patients causes troublesome symptoms and thus establishing the diagnosis of GER disease. However, current symptom association scores are based on adult studies and were established using 24 hour pH monitoring. It is unclear to what extent the criteria for these association scores can be used for combined MII / pH monitoring in infants, presenting with a different range of symptoms. The aim of Chapter 2 was to establish the most optimal criteria for establishing symptom association in infants.

PART II – PHYSIOLOGICAL STUDIES

In Chapter 3 the physiological development of pharyngeal motor patterns in premature infants as studied by newly developed HRM-criteria is described. The aim of Chapter 4 was to get a more precise insight into the effect of body position on GER and the mechanisms underlying it, namely transient lower esophageal sphincter (LES) relaxations. In this study, the body position of infants was changed from the right lateral
position to the left lateral position and vice versa, while transient LES relaxations were recorded manometrically and GER was detected by MII. Furthermore, gastric emptying was measured to get a complete picture of mechanisms influencing the triggering of transient LES relaxations and GER.

Another study looking at the effect of posture is described in Chapter 5, which focuses on the effect of posture on triggering transient LES relaxations and GER episodes during a normal feed, which was infused at a standardized rate.

In Chapter 6 another mechanism, which could be relevant for pathophysiology of GER disease is explored. It has been shown that the presence of a nasogastric tube in infants exacerbates GER. However, not only acid exposure is prolonged, but the actual number of GER events seems to increase. In this study, the hypothesis was tested that distension of the esophagogastric junction could lead to more triggering of transient LES relaxations and hence GER episodes.

PART III – COMPLEX FORMS OF ESOPHAGEAL MOTILITY DISORDERS

In adults that were born with esophageal atresia (EA), esophageal motility is known to be abnormal. Furthermore, infants with (repaired) EA are prone to severe GER disease. However, the pathophysiology is incompletely understood and it is unclear whether esophageal function changes with age. In Chapter 7 gastroesophageal function in infants and adults born with esophageal atresia is described and mechanisms underlying GER episodes are investigated.

Finally, these chapters are followed by a summary and discussion of the results and future perspectives are given.
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