

Esophagus Measuring System

Degree programme : BSc in Micro- and Medical Technology | Specialisation : Medical technology

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The Gastroesophageal Anti Reflux Device (GARD) is an implant placed in the lower esophagus that provides a non-invasive alternative to surgical treatment of gastroesophageal reflux disease (GERD). The patient-specific dimensioning of the implant is essential and requires a measurement of the esophagus with a measuring system, whose development and verification was the purpose of this bachelor study.

Context

Gastroesophageal reflux disease (GERD), which affects an estimated 20% of the Western population, is marked by an abnormally increased backflow of gastric acid into the esophagus. GERD is primarily treated with medications that reduce acid production in the stomach. Another treatment option is surgery, which is often performed in patients whose conditions do not improve with medications.

As an alternative to surgical treatment our industrial partner Biomedix SA develops an implant called GARD, which is placed in the lower esophagus and acts like a one-way valve, preventing gastric acid from flowing back into the esophagus (see figure 1). The implant is held at its intended position by contact pressure against the esophageal wall, which allows a non-invasive and thus less risky treatment of GERD. A dimensioning of the GARD that is adapted to the

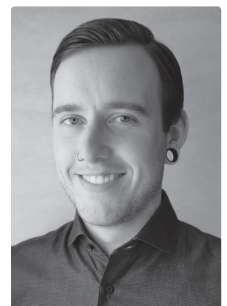
patient is essential to guarantee an optimal contact pressure and thus a safe and long-lasting hold of the implant.

Objective

The measuring system should allow a reliable determination of the lower esophagus diameter, to guarantee an optimal dimensioning of the GARD. The aim of the bachelor thesis was the development and verification of the variation of the measurement system in order to evaluate its suitability for the accurate determination of the esophagus diameter.

Results

As part of the conception phase of the preliminary study, various concepts for measurement systems were conceived with the aim of achieving a precise measurement of the lower esophagus. The catheter balloon (see figure 2), whose internal pressure and expansion can be adjusted by injecting a gas or liquid medium, was found to be the ideal system for measuring the esophagus. A measurement system analysis (MSA) showed that the balloon could achieve an improved precision, even with non-circular shapes such as the esophagus. The minimal achievable size also makes the system perfectly suited for gastroscopic applications, where devices are often fed through the few millimeters wide gastroscope working channel.



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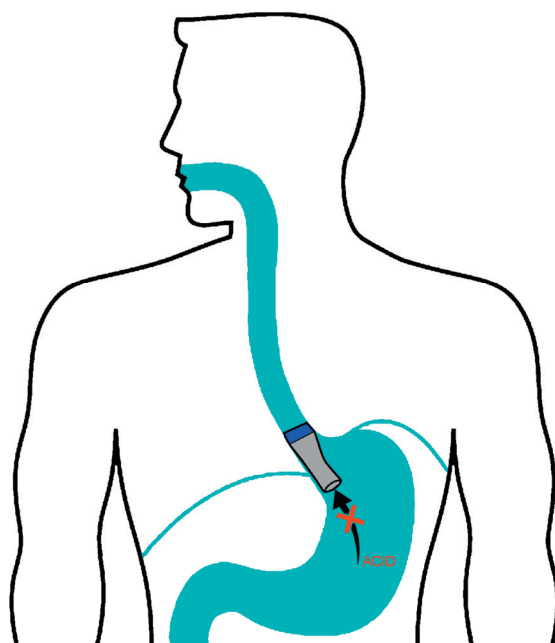


Figure 1: Gastroesophageal Anti Reflux Device (GARD)



Figure 2: Catheter Balloon Measuring System