Research internship: Using tissue engineering to prevent rupture of fetal membranes in endoscopic fetal surgery

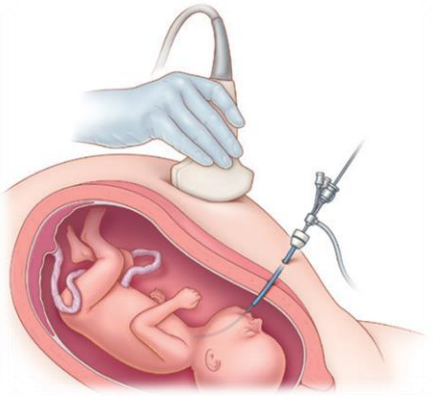

Figure 1 Fetoscopic surgery. Image obtained from Deprest et al. N Engl J Med 2021.

Endoscopic fetal surgery is a rising medical technology to treat children with severe conditions before birth. The fetoscopic surgery can prevent fetal death or the conditions from becoming worse during pregnancy. To perform the surgery, a fetoscope with a diameter of about 3 mm is introduced into the amniotic cavity by puncturing the maternal abdominal wall, uterine wall and fetal membranes. Although fetoscopy has many advantages, the fetoscopic defect in the fetal membranes does not spontaneously heal, cannot be sutured and introduces a high risk for early rupture of the membranes, also known as iatrogenic preterm prelabor rupture of the membranes (iPPROM). iPPROM is a strong trigger for preterm birth, which could lead to increased morbidity or death of the fetus.

The main goal of the entire project is to prevent iPPROM and minimalize the risks of fetal endoscopic surgery by producing an expandable collagen plug with shape memory. Recently, our first article about the expandable collagen plug was published, although research to optimize the plug needs to be performed to bring it into the clinic.

The internship primarily focusses on testing the expandable collagen plug *ex vivo* using fresh human fetal membranes obtained at Radboudumc. For this, you will test the ability of the plug to seal the defect and prevent leakage, and you will culture the membranes with an expandable collagen plug to visualize cellular influx and potential regeneration using histology.

Next to the *ex vivo* experiments with the expandable collagen plug, you will also make plugs, starting from the isolation of type I collagen and analysis of collagen quality parameters to production of the plug using lyophilization and introduction of shape memory.

The internship will be performed at the Dept. of Biochemistry (RIMLS, Radboudumc) at the Matrix Biochemistry group of dr.ir. Willeke Daamen in collaboration with the Radboudumc Dept. of Obstetrics & Gynecology. It is a full-time internship for at least 6 months and we would like to start the student project at the end of 2022 or the start of 2023.

Are you interested? Please send a short motivation together with your CV and grade list to Rob Meuwese MSc (Rob.Meuwese@radboudumc.nl).