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Classics revisited. Raissa Nitabuch, on the uteroplacental circulation and the fibrinous membrane

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ABSTRACT

The adaptive conversion of spiral arteries is essential for pregnancy physiology and incomplete conversion is associated with preeclampsia and intrauterine growth restriction. The anatomy of the uteroplacental circulation as well as the basic concept of nutrition of the foetus had been a matter of dispute among scientists for a long time. Based on the study of an autopsy of a pregnant uterus, Raissa Nitabuch was the first to give an accurate description of the uteroplacental circulation in her doctoral thesis in 1887. In this thesis, the fibrinous layer in the decidua was identified as site of detachment of the placenta from the uterine wall after delivery of the baby. Although this was only an accidental finding, as "Nitabuch membrane" this fibrinous layer up to this day is associated with her name. It is unclear, why the much more important findings on the uteroplacental circulation never were published in a scientific journal.

Today the basic anatomy of the uteroplacental circulation is unquestioned. However, it remains largely unknown, that the first accurate description appeared as a doctoral thesis. In view of the ongoing investigations on function and regulation of uteroplacental circulation, there can be no doubt, that an original publication of the findings of Raissa Nitabuch in a scientific journal today would be a "Classic" deserving to be revisited.

1. Introduction

In the late 19th century Raissa Nitabuch together with a group of female students came from Russia to Switzerland to study medicine. After graduation from the University of Zürich, she moved to Bern, where at the Institute of Anatomy she did a doctoral thesis entitled "Kenntniss der menschlichen Placenta", which as "Inaugural Dissertation" of the University of Bern appeared in print in 1887, Fig. 1 [1].

The mentor of Raissa Nitabuch was Professor Theodor Langhans, whose name is known to placentologists, since he first described the cytotrophoblast [2]. Under his direction, research activities at the Institute of Anatomy at the University of Bern focussed on different topics of placentology such as characterisation of the trophoblast as well as the distribution of fibrinous material at different locations inside the placenta and decidua. This led to several publications on important contributions, which appeared in those years. In her doctoral thesis, Raissa Nitabuch first described a fibrinous layer in the decidua as the region, where after delivery of the baby the placenta detaches from the uterine wall. Up to this day, this layer is known as "Nitabuch membrane".

In the introduction, she describes the anatomical connection of the intervillous space with the maternal vasculature as the main objective of that study. In hindsight, the decidual fibrin layer is just an accidental finding. This dissertation is the first printed document with a detailed description of spiral arteries as the link between the intervillous space and the uterine vasculature. In view of the enduring scientific dispute about the uteroplacental circulation carried out in the late nineteenth and early twentieth century, it remains unclear, why the significance of this important finding at the time was not recognised.

Herein we outline the context of this discovery, which deserves belated appreciation as a classic.

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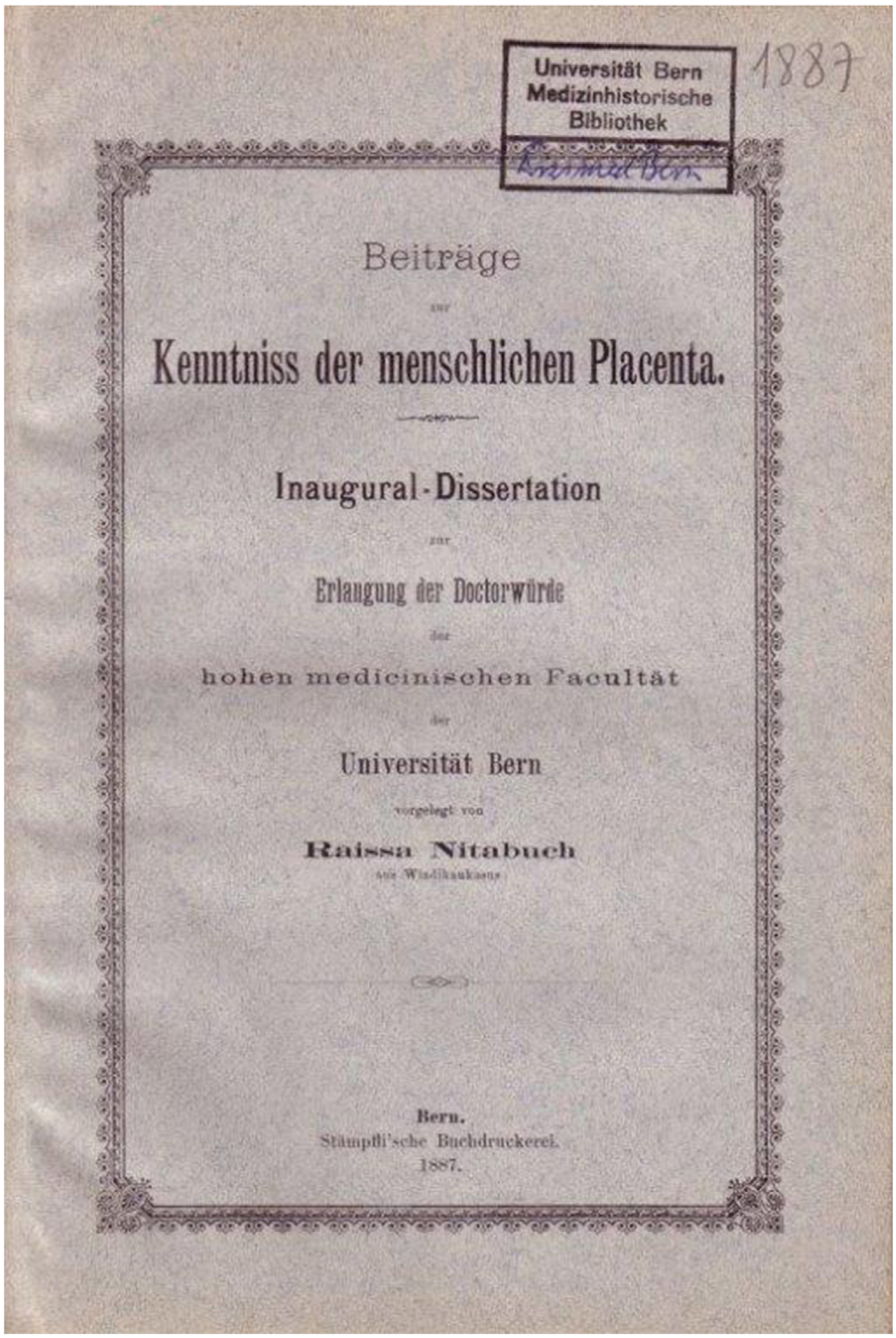

Fig. 1. Title page of dissertation of Raissa Nitabuch.

2. Historical context

2.1. Early indications for circulation of maternal blood inside the placenta

Already in the 18th century, Albrecht von Haller a famous scholar from Bern had postulated with respect to the connection between the uterus and the placenta, that some maternal blood reaches the placenta [3]. A few years later, William Hunter wrote: «Notwithstanding the disputes still subsisting among anatomists, whether any blood vessels pass between the uterus and placenta, and though the texture of these vessels be so exceedingly tender that they break with the least force, they are as demonstrable in a proper subject as any vessel in the body, not only by injections, but in a fresh subject without any artificial preparation. While the placenta remains adhering to the uterus, any injection made by the uterine arteries fills not only these vessels, but also the cellular part of the placenta» [4]. He also correctly described the characteristic appearance of the spiral arteries as«arteries, which generally make a snake-like convolution or two on the surface of the placenta, and give off no anastomosing branches» [4].

More than 100 years later, in the late 19th century when Raissa Nitabuch did her studies, there still was no consensus concerning the anatomy of the vascular connection between the intervillous