Aortic stenosis (narrowing of aortic valve) is currently the most common valvular heart disease. The reason is usually calcification of the valve. It affects 0,2% of population at the age of 50 years, but grows with age to 10% of 80 year olds. Aortic stenosis leads to heart failure with shortness of breath, exercise intolerance and fainting. The prognosis of patients with symptoms of heart failure is worse than in case of cancer diagnosis. Currently the standard treatment of choice of symptomatic aortic stenosis is aortic valve replacement (AVR) - surgical implantation of mechanical valve or bioprosthesis.

One-third of elderly patients is not even qualified for surgery due to age and comorbidities and to high-risk of surgery. New hope for those patients is TAVI- introduced in 2002 less invasive method of percutaneous implantation of biological aortic valve, mostly through the femoral artery.

There is lack of knowledge about the long-term durability of the TAVI valves. Despite that number of TAVI procedure rises even in younger patients.

In our project we want to answer the question about the beginning and the process of degeneration of the implanted TAVI valve.`

Despite the differences in native valves and implanted bioprosthesis structure, it is known that the process of degeneration is initiated by local inflammation, progressively transformed into calcification and ossification, similar to those that occur in the bone. These mechanisms are relatively best known in native valves, less in bioprosthesis implanted surgically, but there is still no evidence in for TAVI valves.

In order to determine degeneration of the TAVI valves will be use highly specialized imaging test- PET CT with the use of inflammatory (18F-FDG) and calcification markers (18F-NaF). So far PET CT was only used in research to evaluate the native aortic valve stenosis. During 2 years of follow-up blood level of biomarkers of inflammation (e.g. resistin, and fetuin, metalloproteinases) and of ossification (e.g. osteopontin, osteoprotegerin, RANKL) will be assess. These biomarkers are not used in everyday medical practice, only in scientific reasearch. Echocardiography and transesophageal echocardiography will be used for standard evaluation of the TAVI valves.

After two years of follow- up PET CT will be repeated and the result compared with baseline. Blood levels of ossification and inflammation biomarkers will be compared with valve changes observed in PET CT. We want find relationships and point out indicators of rapid degeneration of TAVI valves.

To summarize the objectives of the project are:

- to obtain information about the pathogenesis of degeneration of TAVI valve

- to estimate the onset of TAVI valve degeneration

- to find biochemical markers of faster degeneration of TAVI valves

- to evaluate the usefulness of PET CT in the assessment of TAVI valve degeneration

In the future the results of these study can help to identify patients who are at risk of rapid degeneration of the implanted TAVI valve. Confirmation of the effectiveness of PET CT in detection of early degenerative changes of TAVI valve can be used in the research to find out how to slow down valve degeneration process (e.g. medical treatement).