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Initial experience of follow up of patients after the endovascular treatment of abdominal aortic aneurysms using contrast-enhanced ultrasound



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ABSTRACT

Introduction: All patients who underwent the endovascular treatment of abdominal aortic aneurysm require regular check-ups for possible occurrence of endoleak and further growth of the aneurysm. Such check-ups are performed in most cases by CT imaging with the administration of a contrast agent which may cause allergies or impairment of renal functions. CT itself represents a significant radiation dose incurred by the patient. When contrast-enhanced ultrasound (CEUS) is used, patients are exposed neither to these risks nor to X-ray radiation.

Objective: Verify the diagnostic recovery of contrast-enhanced ultrasound for the monitoring of patients after the endovascular treatment of abdominal aortic aneurysms.

Method: Since January 2014 we have been qualifying patients for a prospective study. All patients who have been implanted a stent graft for the infrarenal aortic aneurysm since January 2014 and patients who were implanted a stent graft earlier but who have undergone a check-up since January 2014 are qualified for the study. These patients are always checked up after the surgery by CT angiography and CEUS as well. 16 patients have been qualified for the study so far. After the application of a stent graft we examine our patients before they are discharged from the hospital and 1, 6 and 12 months after the surgery. CEUS is performed by 2 physicians only.

Results: In the 16 patients a total of 28 check-ups have been conducted (1 check-up without contrast medium). In 9 patients (13 CTA examinations and 12 CEUS) endoleak was proven (1 of the I-type, 8 of the II-type). In the case of 2 examinations consistency between CTA and CEUS was not proven – 7.4%. In one case the inconsistency concerned the type of endoleak and in the other case, CTA erroneously described endoleak which was not obvious from CEUS. When measuring the size of an aneurysm sack, we observed significant differences between CTA and CEUS ($p < 0.001$). The CEUS examination was assessable even in the case of obese patients.

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Conclusion: We have observed a 100% consistency in the result of 25 examinations which used both methods. Based on the comparisons between CEUS and CTAG performed so far, CEUS seems to be a reliable method which could be used within the framework of dispensary care for patients after endovascular aneurysm repair (EVAR). CEUS seems to be sensitive enough to detect endoleak. However, to be able to provide a reliable evaluation, a larger set of patients and longer-term experience are needed, specifically for the evaluation of the aneurysm sack size.

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Introduction

We have had the opportunity to study the application of stent grafts (EVAR) for abdominal aortic aneurysm – AAA [1] for thirty years. In the last decade we have seen a significant increase in the number of EVAR compared to open resections of AAA. The endovascular implantation method is being improved on a continuous basis and new methods and stent grafts are being developed. New technologies and materials are used. All the aforementioned aspects result in the extension of indications where we apply the endovascular treatment. EVAR is not used only in patients with the so-called ideal anatomy, but we also treat patients whose anatomical handicap would have practically contraindicated the use of a stent graft in the past [2]. We are not only able to use the endovascular treatment in the case of aneurysms with “unsuitable” neck, but due to the new types of stent grafts with branches or fenestrations, we are able to resolve aortic impairments in the place of the division of the visceral branches [3]. Using the endovascular treatment we are also able to treat certain types of complications resulting from vascular surgeries performed in the aortic area. We have been meeting patients with implanted stent grafts and we are going to meet them more often in the future. On the other hand, we will meet complications of the endovascular treatment more often in the future as well. We are able to solve a number of complications by means of endovascular treatment but there are some which require a surgery. Some types of complications related to EVAR do not require any specific treatment but the patients must be checked up regularly and their development monitored [3,4]. On the other hand, there are very serious complications in the case of which early diagnostics and proper treatment are crucial from the point of view of the patient's life. As it is obvious from the above mentioned, consistent control of patients with an implanted stent graft is of great importance. Most EVAR-related complications are not detectable based on anamnestic data or clinical examination. For this reason, the monitoring must be always completed with imaging examination. The selection of imaging examination may differ depending on the customary approach of individual centres. It is possible to use one of the imaging methods or a combination thereof. CT angiography using iodine-based contrast medium is applied very often. In this case the patients are exposed to the risk

of allergic reaction, nephropathy and a potential risk related to the dose of ionizing radiation absorbed during the examination [5–9].

Methods

A prospective monocentric study focused on the comparison of the results of data acquired from the monitoring of patients after EVAR using CT angiography and contrast-enhanced ultrasound (CEUS) is concerned. The patients have been included in the study since January 2014. All patients with implanted stent graft since January 2014 are eligible. These patients undergo clinical examination and computed tomography angiography (CTAG) and also CEUS always prior to discharge and later after 1, 6 and 12 months within the framework of check-ups. The other patients who are included in the study, are those who underwent EVAR earlier and who underwent check-ups in the course of 2014. These follow-up controls include examinations using both methods as well. EVARs are performed by a team of a vascular surgeon and an interventional radiologist, always under general anaesthesia and with antibiotic prophylaxis. The parameter monitored during examinations is the size of the AAA sack, the presence or absence of endoleak and type thereof and, where applicable, other possible complications (e.g. thrombosis, stenosis, break or disconnection of the stent graft). The CTAG evaluation is performed by physicians – employees of the Department of Imaging Methods of the Teaching Hospital and Faculty of Medicine in Pilsen. Considering the total lower number of performed examinations and the experience, CEUS is performed by only 2 physicians working at the Department of Imaging Methods. Ultrasound examination is conducted with the instruments Siemens Acuson Antares (a CH4-1 convex probe working at frequencies 1–4 MHz) and Siemens Acuson S 2000 (a 4C1 convex probe working at frequencies 1–4.5 MHz) and the SonoVue contrast medium produced by Bracco. All patients who have been enrolled in the study so far had aneurysmal dilatation of the infrarenal aorta or/and the pelvic arteries and for all of them the aortoiliac configuration of the stent graft was selected although this stent graft configuration is not the criterion for the qualification for the study. In none of the patients, a fenestrated or a branched stent graft was implanted. No anamnestic or demographic data excluded the possibility to include the patient in the study. The Statistika

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