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One Year Patient Follow-Up Results after Endovascular Abdominal Aortic Aneurysm Repair at University Medical Centre Ljubljana

ABSTRACT

KEY WORDS: EVAR, endoleaks

BACKGROUNDS. Endovascular abdominal aortic aneurysm repair (EVAR) is commonly used to treat abdominal aortic aneurysms (AAA). In our department, the outcomes following EVAR after 30 days, one year and later have been monitored systematically in all patients since 2023. METHODS. All the patients after EVAR, which were hospitalized at our department from January 2023 until May 2024, have been included in our analysis. Our aim is to follow the outcomes in patients after EVAR during hospitalization, after 30 days, one year and later. RESULTS. This analysis included 107 patients after EVAR (elective and urgent) since the first of January 2023, of these 87 were men and 20 were women (mean age 74.4 ± 5.2). The mean AAA diameter was 58 ± 7 mm. We analysed the duration of hospitalization in elective and urgent patients (5.6 ± 2.9 days and 16.2 ± 8.2 days, respectively). 50% of patients after EVAR had a haematoma on the puncture site. 69 patients already had CT angiography after EVAR by the end of April 2024; there were 23 endoleaks detected (type 2 in 21 patients, type 1 in one patient and type 3 in one patient). DISCUSSION. Since January 2023 and up until now, 107 patients have been treated with EVAR at our centre. The presence of endoleaks type 1, 2 and 3 and other complications are comparable with the data from other registries.

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BACKGROUNDS

Endovascular abdominal aortic aneurysm repair (EVAR) has become a key treatment option for patients with an abdominal aortic aneurysm (AAA) and at our centre it is offered to patients eligible for EVAR according to the guidelines of the European Society for Vascular Surgery (ESVS) *(1)*. It is the preferred option since both short and mid-term outcomes are as good as or better than open surgical repair, but mid- and long-term complications such as endoleaks, graft infection, graft migration, graft obstruction or post-EVAR rupture can lead to endovascular reintervention or conversion to open surgical repair *(1, 2)*.

The University Medical Centre (UMC) Ljubljana is a high-volume centre, and the majority of procedures nationwide are performed here. The outcomes in patients that have been treated with EVAR will be compared with data from other studies and registries, which will allow us to evaluate the quality and possible deficiencies of this treatment at our centre. Data on early and late complications, post-operative computer tomography angiography (CTA) or ultrasound and follow-up after 30 days, one year and later are collected.

METHODS

Our data was collected on an observational, non-randomised, prospective »all comer« basis. All patients, who underwent EVAR and were hospitalized at our department, were included. Information on AAA diameter, duration of hospitalization, early complications during the procedures and during hospitalization (haematoma, other early complications), outcomes after 30 days, one year and later (endoleaks, aneurysm sac growth, infections, ruptures, other adverse events, death) were collected and analysed. Our follow-up included a CTA and a clinical examination after EVAR at recommended intervals. All patients after EVAR were included, be it elective or urgent, but there were no patients with a ruptured AAA.

RESULTS

From January 2023 until May 2024, a total of 107 patients underwent EVAR and were admitted before the procedure and hospitalized at our department, of that 87 were men (82%) and 20 were women (18%). The average patient age was 74.4 ± 5.2 years. 96 operations were elective and 11 patients required urgent EVAR due to a symptomatic AAA (90% versus 10%). There were no patients with ruptured AAAs after EVAR since they were admitted to other departments. The AAA diameter was 58 ± 7 mm; 56 ± 6 mm in elective patients, and 70 ± 14 mm in urgent patients. AAA diameter advanced with patient age (figure 1). The hospitalization duration was different for elective and urgent patients; 5.6 ± 2.9 days (median 4 days) for elective patients, and 16.2 ± 8.2 days (median 16 days) for urgent patients. 50% of patients had a haematoma on the puncture site, but only one patient required surgical revision of the pseudoaneurysm. In the first 30 days after EVAR, two patients returned because of complications on puncture sites – the first patient was re-admitted due to bleeding from the wound after EVAR and required additional procedures; the second patient needed additional procedures and antibiotic treatment due to an infection of the puncture site.

Patients with a detected type 1 endoleak (1 patient) and type 3 endoleak (1 patient) at procedure were treated immediately during the procedures.

One patient was re-admitted after one week due to a type B aortic dissection, which was managed conservatively. One patient was admitted after a couple of months due to graft aortitis and was treated with long-term antibiotics. One patient died six months after the procedure, her death was not aneurysm-related.

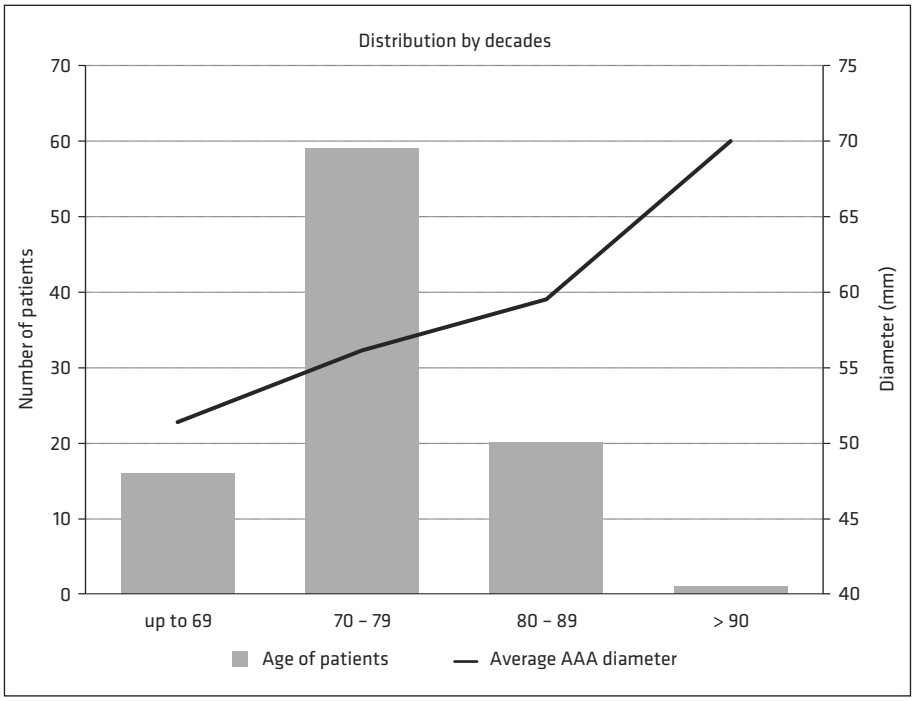

Figure 1. Comparison of abdominal aortic aneurysm (AAA) diameter and patient age.

So far, 69 patients have had the first CTA after EVAR at intervals, recommended by an interventional radiologist or a specialist of vascular medicine (one to six months after EVAR). A type 2 endoleak was detected in 21 patients (31%) with a stable aneurysm sac or detected aneurysm growth (three patients), one of them was already referred for the embolization of lumbal arteries, others will all be closely monitored. Two patients with a detected type 1 and type 3 endoleak on follow-up CTA had additional procedures. Patient characteristic, hospitalization duration and outcomes are presented in table 1.

DISCUSSION

The one-year follow-up of patients after EVAR has shown promising outcomes regarding early complications, the presence of endoleaks and aneurysm-related deaths in comparison with data from other registries *(2, 3)*.

There were no patients included with ruptured AAAs, 10% patients with AAA were admitted due to symptoms (stomach or back pain), which could not be attributed to other causes. The management and hospitalization of these patients were longer than for elective patients, as they needed more diagnostics and had to wait for the procedure in the hospital. Elective patients were admitted one day before the planned procedure. AAA diameter in urgent patients was larger compared to elective patients. In literature, there is not much data comparing outcomes after EVAR in elective and urgent patients without a ruptured AAA. This distinction is taken in consideration mainly due to analysis purposes.

The most frequent complication during hospitalization is a haematoma on the puncture site, which can be managed conservatively in most cases. Only one patient needed a surgical revision of the pseudoaneurysm. Two patients were re-admitted

in the first 30 days after EVAR due to either bleeding or wound infection (1.8%). In general, local wound complications include groin hematoma, infection, or lymphocele, the incidence is 1 to 10%. Arterial thrombosis, dissection, or pseudoaneurysm formation can occur in up to 3% of EVAR procedures *(4)*. Half of our patients had a haematoma on the puncture site, but we included all haematoma with a diameter of over 5 cm and which do not necessarily require further management.

One patient was re-admitted after one week due to a type B aortic dissection, which

Table 1. Patient characteristics, duration of hospitalization and outcomes. EVAR – endovascular abdominal aortic aneurysm repair, SD – standard deviation, CTA – computer tomography angiography.

Characteristic	
Age	74.4 ± 5.2
Sex	
male	87 (81%)
female	20 (18%)
All EVAR	107
electivež	96 (90%)
urgent	11 (10%)
Diameter of aneurysm	58 ± 7 mm
elective	56 ± 6 mm
urgent	70 ± 14 mm
Duration of hospitalization	
mean value and SD	6.7 ± 4.2 days
median	4 days
min	2 days
max	36 days
Duration of hospitalization – elective	
mean value and SD	5.6 ± 2.9 days
median	4 days
Duration of hospitalization – urgent	
mean value and SD	16.2 ± 8.2 days
median	16 days
Presence of hematoma	
no hematoma	54 (50%)
hematoma	53 (50%)
With control CTA scan	69
no enodoleak	46 (67%)
endoleak type 1	1
endoleak type 2	21 (31%)
endoleak type 3	1

was a complication of EVAR – a rare but serious adverse event. There have only been few reports of similar events in literature *(5)*. Most cases of type B dissections are uncomplicated and can be managed by medical therapy, including antihypertensive drugs, which was the case with our patient as well.

One patient was admitted after a couple of months due to graft aortitis, which has so far been managed conservatively with antibiotics. Due to the patient's age and psychophysical condition, new invasive therapies or reinterventions are not recommended. EVAR infections show high mortality rates for every kind of treatment employed, as patients unsuitable for major surgery experience the same chance of survival as patients submitted to an endograft explant *(6)*.

In our cohort study, endoleaks were present either at procedure or on the first follow-up CTA. Reinterventions were necessary for type 1 and type 3 endoleaks, patients with type 2 endoleaks are currently under surveillance. Type 2 endoleaks are most common and the early incidence is usually reported to be around 25%, but most resolve spontaneously during the first six months. Up to 10% of type 2 endoleaks persist and they may cause aneurysm growth, in which case, treatment should be considered *(7)*. In our cohort, type 2 endoleaks are present in 31% of patients. In one patient, the embolization of lumbal arteries was already performed, other patients with a type 2 endoleak and aneurysm sac growth will be closely monitored.

Limitations

Registries, by nature, are observational and are not designed in the same manner as a randomized control trial would be. Maintaining adherence to follow up in patient registries is more challenging than in a trial. Data is collected in real life and although the compliance with follow up has been excellent (almost 100%) so far, we expect a drop in the following years.

CONCLUSIONS

The outcomes of the one-year follow-up on patients after EVAR at the UMC Ljubljana have been positive so far. There has been no rupture or aneurysm-related deaths and patients with a type 2 endoleak will be monitored further. Longer term follow up is necessary for the assessment and comparison of the outcomes in our patients against existing data from other registries and trials.

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