Short-Term Outcomes of Endovascular Aortic Repair in King Hussein Medical Centre: A Single-Centre Experience

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ABSTRACT

Objective: Endovascular repair had been considered as a viable treatment modality for aortoiliac aneurysms. Our aim in this study is to present the short-term outcomes of endovascular aortic repairs performed in our division and to compare our outcomes with those of other institutions.

Methods: The records of patients who underwent endovascular aortic repair in the interventional radiology department between January 2015 and December 2019 were reviewed. 137patients (125 male), mean age 71.6 (7.1) years, had endovascular aortic repairs in our centre. The main indications for endovascular aortic repair were abdominal aortic aneurysm exceeding 5.5 cm and symptomatic abdominal aortic aneurysm irrespective of the aneurysmal size.

Results: There were 2/137 early postoperative deaths. The average hospital stay was 2.1 days. One patient developed fatal myocardial infarction, and eight patients developed femoral artery Pseudoaneurysms. Four patients had temporary kidney dysfunction, but none of them needed haemodialysis. Eight patients developed early type II endoleak; all of them were treated conservatively; four patients needed re-intervention after a 1-year period.

Conclusion: In our opinion, endovascular aortic repair can be performed safely with minimal early risks.

Key words: Abdominal Aortic Aneurysm, Endovascular Intervention, Endoleak, Femoral Artery Pseudoaneurysm

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INTRODUCTION

The true prevalence of abdominal aortic aneurysm (AAA) worldwide is variable and hard to estimate, since few countries perform population-based ultra-sonographic screening (1). In addition, gender and ethnic variation in the prevalence of this pathology amongst the screened cohorts have also been noticed (2). Reports from the Centres for Disease Control and Prevention demonstrated that AAA ranks as the 12th–15th leading cause of death in patients aged above 55 years in the United States and European countries (1).

Treatment modalities for AAA include open surgical repair and endovascular aortic repair (EVAR). Open surgical repair has been a well-established treatment over the past several decades. EVAR has evolved

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over the past three decades as a less invasive method compared to open surgical repair and has become more popular in many international centres because of its improved early survival and shorter hospital stays (3, 4). However, this tempting modality is not without complications, such as vascular access problems, endoleaks, stent kinking, and thrombosis (5, 6). In this study, we investigated all the records for patients who underwent EVAR in our unit over the past 4-year period.

METHODS

We retrospectively reviewed all the charts of the patients who underwent elective EVAR for infra-renal AAA between January 2015 and December 2019. The Institutional Review Board approved the study protocol for the Royal Medical Services. Emergency EVAR, ruptured AAA, and dissected aneurysms were excluded from our study cohort.

Patients' relevant demographics, comorbidities, and risk factors were collected (Table I), as well as important anatomical features, including aneurysmal location and maximum dimension, size, and proximal length, all of which we assessed carefully during our EVAR planning (Table II).

Patients with sizable AAA were offered EVAR if they had a significant risk profile for undergoing open surgical repair or upon the patient's wishes and if they had favourable aneurysmal anatomy. All patients had baseline angiographic computed tomography (CT) to delineate the details of the AAA and plan the proper sizing. All procedures were performed under local anaesthesia utilizing a percutaneous approach, unless the open groin approach was needed. The Medtronic Endurant II bifurcated stent graft (Medtronic International Ltd, Nasaco Tech Centre, Singapore) was used in all the cases.
Outcomes during and early in the post-procedure period were recorded, including early mortality, vascular access complications, stent graft thrombosis or kinking, and type II endoleaks.

Table I: Baseline demographics and comorbidities of the included patients

Baseline patient characteristics (n) (%)	**EVAR (137)**
Age, Mean (SD)	**71.6 (7.1)**
Male Sex	**125 (91.2)**
Smoking	**106 (77.4)**
Diabetes Mellitus	**58 (42)**
Systemic Hypertension	**112 (81.2)**

Kidney Dysfunction (Creatinine > 2.0 dl/l)	**5 (3.7)**
Ischemic Heart Disease	**87 (63.5)**
Chronic Obstructive Pulmonary Disease	**45 (32.9)**
Dyslipidemia	**65 (47.5)**

Abbreviations: EVAR: Endovascular Aortic Repair, SD: standard deviation

Table II: Anatomical Features of the Treated Abdominal Aortic Aneurysms

Anatomical Feature	**EVAR (137)**
Infra-renal	**137 (100%)**
Mean Aneurysmal diameter mm	**64.3**
Mean Neck Length mm	**21.6**
Neck length < 15 mm, (n, %)	**3 (2.2)**
Calcification in the Neck, (n, %)	**68 (25.2)**

Abbreviations: EVAR: endovascular aortic repair, SD: standard deviation

RESULTS

During our study period, 137 patients had EVAR and fulfilled our inclusion criteria. Two (1.5%) had early mortality after the procedure: One patient had fatal acute myocardial infarction, and the other was related to acute respiratory failure. Eight patients (5.8%) had femoral artery Pseudoaneurysms; all of them were treated surgically by simple femoral arterial reconstruction. Eight patients (5.8%) had early type II endoleaks, all of which were treated conservatively; however, four of them needed late re-intervention after a 1-year period. Four (2.9%) patients had early stent graft thrombosis. The average hospital stay period was 2.1 days. All the outcomes are summarized in Table III.

Table III. Early Outcomes after EVAR

Outcome	EVAR (137)
Early Mortality	**2 (1.5)**
Vascular Access Pseudoaneurysm	**8 (5.8)**
Endograft Thrombosis	**4 (2.9)**
Endoleak Type II	**8 (5.8)**
Length of Stay days, Mean, SD	**2.1**
Myocardial Infarction	**1 (0.7)**
Kidney Dysfunction	**4 (1.5)**

Abbreviations: EVAR: endovascular aortic repair, SD: standard deviation

DISCUSSION

Since it was introduced in 1991 as a treatment option for AAA, EVAR has been more widely utilized in the United States (4). This increasing tendency does not reflect a replacement of open surgical repair by EVAR, but rather a complementary management for those patients with a higher risk profile for undergoing open surgical repair. Early mortality was reported in two cases (1.5%) in our cohort. Those patients had multiple comorbidities: One had ischemic heart disease and chronic obstructive airway disease and suffered from myocardial infarction early after the procedure, and the other had acute respiratory failure and needed prolonged ventilation.

Our results in terms of early mortality are comparable to those of other larger trials from multi-institutional reports, such as the OVER trial (7-9). The reported improved early survival in EVAR could be due to the less-invasive insertion methods, such as the percutaneous technique utilizing local anaesthesia, and the improved physiological profiles for the devices used, or it may be due to the avoidance of aortic clamping, which is used in open surgical repair.

Endoleaks are the most common troublesome outcome after EVAR, which may happen in up to 50% of patients in certain series (10). Type II endoleaks are the most common variety to occur, and there are debates surrounding the best management strategy amongst interventional radiologists and vascular surgeons (11). Recommendations by the Society of Vascular Surgeons indicated that conservative treatment is acceptable, but intervention is needed if the sac expands by more than 10 mm (12). Eight patients developed early endoleaks, and all of them were managed conservatively initially; however, re-interventions were needed in four patients via endovascular methods later after a 1-year period.
Vascular access complications such as iliofemoral dissection or even rupture and intimal plaque disruption are well known and reported in association with the EVAR procedure (13). Factors that may predispose to this untoward outcome include heavy arterial calcifications and tortuous, small-diameter femoral and iliac arteries (14). Our series demonstrated eight cases of vascular injuries; all of them were managed promptly by simple femoral artery reconstruction with the help of our vascular surgery colleagues, and none of the patients had negative impacts on survival related to this complication. Our planning and anticipation of such complications in vulnerable patients and improving the skills amongst our team may lead to the improvement in this outcome.

Graft thrombosis or graft limb occlusion has been reported by many authors in the literature as a possible negative outcome leading to re-interventions; factors related to graft thrombosis include poor deployment of the distal limb of the endograft or stent kinking (15). Luckily, only four (2.9%) patients had early graft limb thrombosis in our cohort which comparable or even better than reported in other studies (16), but to be fair, in our reporting, long-term follow-up is needed to accurately assess this outcome, since many of these cases of stent thrombosis have EVAR thrombosis during long-term follow-up.
We did not include quality of life as an endpoint in our study. Patients who have undergone open surgical repair can accept minor functional disabilities and discomfort related to surgery, while patients who have had the EVAR procedure expect themselves to recover quickly, so they cannot accept any deviation from the norm. Thus, interpretation of this endpoint may be subject to patient subjective reporting bias.

Our study has some limitations that are worth mentioning. Being retrospective in nature meant that some important patient data were missed. In addition, our data gathering was limited to the index admission period without the important post-dismissal relevant outcomes, which we think are crucial in assessing the functional ability of the endograft over long-term follow up. Nevertheless, this study demonstrated several valued strengths, which were derived from the referral hospital sample size, absence of biased selection of the patients, and standardized methods of management strategies.

CONCLUSION

Our experience with EVAR in the treatment of AAA is encouraging. Early outcomes, including early mortality, vascular access complications, and endoleaks, are comparable to what has been reported in other trials and registries. We would like to stress the importance of a national EVAR registry that includes long-term follow-up to demonstrate the implant device's function over a long period.

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