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Original Article

The One-Year Results of Endovascular Aneurysm Repair for Infrarenal Abdominal Aortic Aneurysm in Rajavithi Hospital

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Abstract

Objectives: To study the one-year results of EVAR for infrarenal AAA patients in Rajavithi Hospital.

Methods: This study conducted a retrospective chart review of all patients with infrarenal AAA who underwent EVAR between January 2017 and February 2021. Medical records were analyzed for demographic data, anatomic features of AAA, procedural details, and 30-day and 1-year outcomes. The primary outcomes were technical success and clinical success at one-year follow-up. Secondary outcomes included perioperative complications, mortality, stent-graft-related complications, and secondary interventions.

Results: This study included 43 patients (32 men) with a mean age of 72 ± 8.4 years. Successful primary technical success was achieved in 40 patients (93%). The mean operative time was 150.8 ± 58 min, and the median estimated blood loss was 150 ml. The median hospital stay was eight days. Major complications occurred in 9 (20.9%) patients, including 1 myocardial infarction, 1 congestive heart failure, 2 cardiac arrhythmias, 3 pneumonia-related respiratory failures, 2 ischemic colitis, and 2 renal failures requiring hemodialysis. The 30-day mortality was 4.7% (2 patients; one with infected AAA with aortoenteric fistula, and one with pneumonia and multisystem organ failure. A 1-year overall mortality was 16.3%, and AAA-related mortality was 2.3%. A 1-year clinical success rate of 91.4% was observed in 32 out of 35 patients. No cases of stent-graft thrombosis, stent-graft infection, ruptured AAA, open conversion, or type III or IV endoleak were documented in the study.

Conclusion: EVAR can be successfully performed at Rajavithi Hospital with high success and low AAA-related mortality rate. However, it is crucial to emphasize the importance of surveillance to promptly detect and effectively treat any potential complications that may arise.

Keywords: Endovascular aneurysm repair, Abdominal aortic aneurysm, EVAR, Endoleak

Introduction

An abdominal aortic aneurysm (AAA) is characterized by the dilatation of the infrarenal aorta, with a diameter exceeding 3 cm or 50% of the aortic diameter.[1] If left untreated, degenerative changes in the vessel wall can result in further dilation and eventual rupture. The prevalence of AAAs in the Western population has been documented to range from 4% to 7.2%.[2-4] Open Surgical Repair of AAA (OSR) has traditionally served as the standard treatment for AAAs. This procedure involves the excision of the dilated area and the placement of a prosthetic graft. Nonetheless, Endovascular aneurysm repair (EVAR) stands out as a minimally invasive procedure for the management of AAAs. EVAR has gained widespread acceptance as an established therapeutic modality for patients with suitable anatomical profiles

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ever since the first case reported by Parodi JC et al. in 1991.[5] Several studies have demonstrated that EVAR decreases perioperative morbidity and mortality, blood loss, and transfusions, the use of the intensive care unit, and the length of hospital stay as compared to an open aortic surgical repair procedure.[6-10]

In Thailand, the management of AAAs through EVAR has notably advanced, with reports demonstrating its safety and favorable outcomes.[11-13] Despite being a tertiary referral center in Bangkok, Thailand, Rajavithi Hospital has not yet implemented EVAR procedures. In an effort to enhance our capacity for treating AAA patients using endovascular techniques, we have initiated the establishment of dedicated vascular and endovascular surgery teams, making the commencement of EVAR procedures within our institution.

The objective of this study is to assess the one-year post-treatment outcomes of patients with infrarenal AAAs who underwent EVAR at Rajavithi Hospital.

Materials and Methods

Patients

This retrospective chart review included all consecutive patients who underwent EVAR due to an infrarenal AAA from January 2017 to February 2021 in the Vascular Unit, Department of Surgery, Rajavithi Hospital. The study protocol was approved by the Rajavithi Hospital Ethics Committee. All patients with an infrarenal AAA have performed computed tomographic angiography (CTA) preoperatively. Eligible patients requiring intervention due to at least one of the following indications:

- AAA-maximal diameter ≥ 55 mm (man)
- AAA-maximal diameter ≥ 50 mm (woman)
- Rapid expansion: > 1 cm / year or 0.5 cm / 6 months
- Any sizes of saccular morphology
- All Symptomatic AAA
- Iliac aneurysm diameter > 30 mm

All patients' clinical preoperative, perioperative, and follow-up data were obtained from the electronic medical record system and chart review. The standardized postoperative protocol was scheduled for outcome assessment at one month and 12 months, involving CTA of the whole aorta. In cases where patients exhibited impaired renal function, a combination of duplex ultrasonography (DUS) and non-contrast CT of the whole abdomen was conducted. The process of planning, sizing, and selecting any devices of EVAR was performed by the vascular surgeon. Patients presented with suprarenal, juxtarenal AAA, or post-cardiopulmonary resuscitation and underwent open surgical repair were excluded from this study.

Preoperative analysis

The following characteristics of the included patients were obtained: age, gender, co-morbidities, American Society of Anesthesiologists (ASA) score, and laboratory tests for renal function (creatinine).

The AAA characteristics measured on the preoperative CTA scans were AAA neck length, AAA neck diameter, calcification and thrombus in the AAA neck, proximal AAA neck angulation, maximum AAA diameter, length and diameter of the common iliac arteries (CIA), and presence of iliac artery aneurysm.

Diameter and length measurements were performed with the use of a center lumen line (CLL). All diameters were measured perpendicularly to the CLL from the outer wall to the outer wall. The aortic neck length was measured from the most distal renal artery to the first discernible level, where the aortic diameter increased by 10%. Aortic neck diameters were measured at the level of the lower border of the most distal renal artery and every 5 mm from this level until the start of the aneurysm. The calcification and thrombus in the aortic neck were measured at 10 mm below the most distal renal artery and were visually quantified and classified into groups of < 25%, 25% to 50%, and > 50% of the aortic circumference lined by thrombus or calcification.

The morphology of the proximal aneurysm neck of the study patients was classified as within or outside the instruction for use (IFU) of the selected stent graft.

Perioperative and 1-month postoperative analysis

The following perioperative characteristics of the study patients were noted: type of anesthesia, type of stent grafts, operation time, the volume of contrast agent used, total minutes of fluoroscopy, estimated total blood loss and blood transfusion, intraoperative adjunctive procedure, endoleak at completion angiography. Also noted were the procedurally-related problems, perioperative complications, postoperative ICU and hospital length of stay, and reinterventions.

Patients who encountered complications such as endoleaks, device migration, stent fractures, graft deterioration, or aneurysm growth necessitating reintervention underwent subsequent assessment.

Following the reintervention procedure, these patients underwent CTA of the whole aorta for the next 6 months and 12 months for continued monitoring and evaluation.

One-year postoperative analysis

All complications, reinterventions, outpatient department visits, readmissions, deaths, causes of death, and additional CTA scans were noted and analyzed. The following characteristics were investigated on the CTA scan performed 1 year after the EVAR procedure: AAA diameter, existence of endoleak, patency of renal arteries, diameter of the AAA neck, and distance from the most distal renal artery to the most proximal stent graft ring. The CTA scans were also checked for any other EVAR-related abnormalities. Additional survival data was obtained by follow-up visits and telephone contact at the end of the study.

Outcomes

Primary outcomes consisted of technical success and clinical success at one year. Secondary outcomes included procedural details, length of intensive care unit (ICU) and hospital stays, perioperative complications, perioperative and one-year mortality, and outcomes of stent-graft-related complications: presence of endoleak, aneurysm expansion, stent graft migration, stent graft thrombosis, AAA rupture, secondary intervention rate, and conversion to open repair.

Definition of success

The definition of success was defined as described by the Society for Vascular Surgery/International Society for Cardiovascular Surgery Ad Hoc Committee on Reporting Standards for Endovascular Aortic Aneurysmi Repair.[14]

In brief, *Technical success* was defined as the successful endograft deployment through a remote site, including the common iliac arteries, to the landing zone with no evidence of type I or III endoleak, limb occlusion, hemodynamically significant stenosis on completion angiography, or need for any unplanned surgical or endovascular interventions on the endograft within the next 24 hours.

Assisted primary technical success referred to aneurysm exclusion and a patent graft after an adjunctive intraoperative procedure.

Clinical success was defined as freedom from aneurysm rupture, aneurysm expansion ≥ 5 mm, type I or III endoleak, graft migration (≥ 10 mm), limb occlusion, aneurysm-related mortality, secondary intervention, or surgical conversion.

Definition of endoleak

Endoleak is defined by the persistence of blood flow outside the lumen of the endoluminal graft but within the aneurysm sac, as determined by an imaging study.[14] Endoleaks were categorized as periprosthetic (type I: inadequate sealing of the attachment zone), branch vessel (type II: retrograde flow via an aortic side branch), transgraft (type III: direct graft fabric defect or disconnection of modular graft components) endoleaks, or a blush of contrast inside the aneurysm sac through graft fabric porosity (type IV). Aneurysm enlargement in the absence of demonstrable perfusion was defined as endotension (type V). For time-to-endoleak analysis, all patients with detectable endoleak during follow-up were counted as positive for endoleak, regardless of whether the endoleak subsided or persisted at the time of the last available follow-up CTA scan study. Immediate treatment was recommended for all type I and III endoleaks. Uncomplicated type II endoleaks were observed.

Statistical analyses

All statistical analyses were conducted using SPSS software (SPSS Inc., Chicago, III, version 20). Continuous data are presented as the means ± standard deviation or median (range) for nonparametric variables (normal distribution evaluated using the KolmogorovSmirnov test); categorical data are given as the counts (percentage).

RESULTS

DEMOGRAPHICS AND BASELINE CHARACTERISTICS

Between January 2017 and February 2021, 43 patients with infrarenal AAA were treated with EVAR. Demographic data and comorbidities of the patients are shown in Table 1. Their mean age was 72 ± 8.4 (range, 52 - 90) years, and 74.4% were males. Cardiovascular risk factors and smoking were present in the majority of patients. The mean preoperative serum creatinine value was 1.09 mg/dL (range, 0.39 - 2.92 mg/dL). According to the American Society of Anesthesiologists classification, 4 of the 43 patients (9.3%) were classified as class II, 37 (86%) as class III, and 2 (4,7%) as class IV.

Table 1 Demographic and Clinical Characteristics

Characteristics	Result (n = 43)
Age	72 ± 8.4
Gender	
Male sex	32 (74.4)
Comorbidities	
Smoking	29 (67.4)
Hypertension	35 (81.4)
Hyperlipidemia	20 (46.5)
Diabetes mellitus	8 (18.6)
Coronary artery disease	9 (20.9)
History of myocardial infarction	8 (18.7)
Ejection fraction < 50%	4 (9.3)
Chronic obstructive pulmonary disease	2 (4.7)
Cerebrovascular disease	5 (11.6)
Chronic kidney disease (creatinine > 1.5 mg/dL)	8 (18.6)
Cancer	3 (7.0)
ASA classification	
II	4 (9.3)
III	37 (86.0)
IV	2 (4.7)
Aortoiliac morphology	
Maximum aneurysm diameter (mm)	55.1 ± 13.4
Aortic neck length (mm)	29.5 ± 14.0
Aortic neck diameter (mm)	21.4 ± 2.9
Proximal neck angle (degree)	40 ± 19.0
Neck calcification (No.)	
< 25%	30 (69.8)
25-50%	11 (25.6)
> 50%	2 (4.7)
Neck thrombus (No.)	
< 25%	22 (51.2)
25-50%	18 (41.9)
> 50%	3 (7.0)
Right common iliac artery length (mm)	39.2 ± 18.9
Right common iliac artery diameter (mm)	15.9 ± 7.4
Left common iliac artery length (mm)	40.2 ± 16.7
Left common iliac artery diameter (mm)	13.9 ± 4.4
Common iliac artery aneurysm	
Unilateral	7 (16.3)
Bilateral	2 (4.7)
Diameter (mm)	30.7 ± 8.8
Hypogastric artery aneurysm	
Unilateral	4 (9.3)
Bilateral	0

Value is represented as means ± standard deviation (range) or number (%)

Anatomical characteristics of the abdominal aortic aneurysms are shown in Table 1. All aneurysms were infrarenal, with an average maximal diameter of 55.1 ± 13.4 (range, 27 - 84) mm. Proximal neck anatomy was mostly favorable, with a mean diameter of 21.4 ± 2.9 (range, 17 - 28) mm and a mean length of 29.5 ± 14 (range, 10 - 67) mm. Proximal aortic neck angulation exceeded 60° in 8 patients. Common iliac artery aneurysms and hypogastric artery aneurysms were present in 9 and 4 patients, respectively, while 33 patients had an isolated AAA.

Of the 43 patients, 29 (67.5%) had asymptomatic AAAs, while 14 (32.5%) had symptomatic AAAs, including concealed ruptured AAA in 1 and nonruptured symptomatic AAAs (vague abdominal, back pain or prolonged fever) in 13 patients. The AAA was fusiform in 33 patients and saccular in 10 patients. Four patients had infected AAAs. The primary indication for intervention was preventing AAA rupture in 38 patients and preventing a large iliac aneurysm in 4 patients.

Perioperative results

All EVAR procedures were performed under general anesthesia, and the initial endograft deployment was successful in all patients.

Three different bifurcated endovascular devices were used: an Endurant stent graft in 24, an AFX2 stent graft in 16, and an Ovation iX stent graft in 3 patients. Among patients with Endurant stent graft, six of the 24 patients had at least one anatomic characteristic that was considered a violation of the IFU of the Endurant stent graft: three patients had an aneurysm neck diameter less than 19 mm, two patients had an infrarenal neck angulation exceeding 75°, and one patient had an aneurysm neck length of 10 mm along with an infrarenal angulation exceeding 60°. Among patients with AFX2 stent graft, two of the 16 patients had at least one anatomic characteristic that was considered a violation of the IFU of the AFX2 stent graft: two patients had an aneurysm neck diameter less than 18 mm, and one of these two patients

Table 2 Operative details

Parameter	Result (n = 43)
Primary technical success	40 (93.0)
Assisted-primary technical success	42 (97.7)
Operative time (min)	150.8 ± 58
Estimated blood loss (ml)	150 (10-500)
Packed red cell transfusion (ml)	0 (0-888)
Fluoroscopy time (min)	29 (7-136)
X-ray dose (mGy)	176 (10-643)
Volume of contrast medium (ml)	75 (25-160)
Stent-graft types	
AFX2	16 (37.2)
Endurant	24 (55.8)
Ovation iX	3 (7.0)
Type of stent-graft application according to instruction for use (IFU)	
Within IFU	35 (81.4)
Outside IFU	8 (18.6)
Intraoperative adjunctive maneuvers	17 (39.5)
Proximal aortic extension for type Ia endoleak	1 (2.3)
Hypogastric embolization and distal sealing in EIA	12 (27.9)
PTA of the common iliac artery	1 (2.3)
Additional compliance balloon expansion	2 (4.7)
Additional distal extension	2 (4.7)
Embolectomy	1 (2.3)
Endoleak at completion angiogram	10 (23.2)
Type I	1 (2.3)
Type II	9 (20.9)

Continuous data are presented as means ± standard deviation or median (range); categorical data are given as the number (%)

also had an aneurysm neck length of 13 mm along with an infrarenal angulation exceeding 60°.

Embolization of the hypogastric artery and extension of the stent graft to the external iliac artery (EIA) was performed in 12 patients with an inadequate distal landing zone, a CIA diameter greater than 30 mm, or an accompanying hypogastric artery aneurysm and iliac extension cuff was needed in 2 patients to seal a dilated or aneurysmal common iliac artery. One patient required iliac artery balloon angioplasty before device insertion due to bilateral CIA stenosis. One patient underwent immediate embolectomy due to absent pedal pulses after the EVAR procedure; no thrombus or emboli were found, and the completion angiogram showed a vasospasm. A primary technical success of the EVAR procedure was achieved in 40 (93%) patients. Three patients required an unplanned additional procedure due to intraoperative type Ia endoleaks, for which two patients were successfully treated with a proximal aortic cuff and an additional compliance balloon expansion. One other patient was left with a small amount of type Ia endoleak after an unsuccessful attempt at additional compliance balloon expansion (97.7% assisted primary technical success). Additional interventions were performed during the EVAR procedures in 17 patients; the type of interventions can be found in Table 2.

The mean operative time was 150.8 ± 58 minutes (range, 60-345 minutes), with a median estimated median blood loss of 150 mL (range, 10-500 mL), a median volume of contrast agent used of 75 mL (range, 25-160 mL), and a median fluoroscopy time of 29 minutes (range, 7-136 minutes).

Completion angiography showed a type II endoleak in 9 patients and a type I endoleak in one patient. No conversions to open repair or procedural deaths were noted.

One-month postoperative analysis

The median intensive care unit (ICU) stay was 1 day (range, 0-22 days), and the median length of postoperative hospitalization was 8 days (range, 4-28 days).

Table 3 Perioperative morbidity and mortality

Events	Results
Patients with postoperative complications*	22/43 (51.2)
Cardiac events	8
Cardiac arrhythmia	4
Congestive heart failure	1
Hypertensive urgency	2
Myocardial infarction	1
Pulmonary events	4
Atelectasis	1
Pneumonia	3
Bowel ischemia (Ischemic colitis)	2
Neurological events	0
Renal failure	6
Vascular/Graft-related events	4
Arterial insertion trauma	1
Incidental bilateral IIA occlusion	2
Renal artery occlusion	1
Wound complication	2
Others	3
Delirium	1
Urinary tract infection	2
Mortality	2/43 (4.7)
AAA-related mortality	1
Other cause	1

Value is represented as number or number/number (%)

*One patient may have more than one complication

The 30-day mortality rate was 4.3% (2 patients). One patient underwent emergency surgery due to an infected aneurysm with an aorto-enteric fistula, the American Society of Anesthesiologists (ASA) Class IV. The patient had multiorgan failure and died 22 days after EVAR. One other patient with chronic obstructive pulmonary disease (COPD) died due to pneumonia-related respiratory failure at 27 days postoperatively.

A total of 29 complications were observed among 22 patients, as detailed in Table 3. Major complications included 1 myocardial infarction, 1 congestive heart failure, 2 cardiac arrhythmias, 3 pneumonia-related respiratory failures, 2 ischemic colitis, and 2 renal failures requiring hemodialysis.

Implant-related complications occurred within 30 days of the procedure in four patients. In the first patient, who had a concealed ruptured aneurysm with a neck length of 10 mm and an infrarenal angulation exceeding 60°, a standard EVAR was performed with a stent graft placed below the superior mesenteric artery (SMA). Due to the emergency condition, the physician decided to cover both renal arteries and provide correction if needed. The patient experienced acute renal injury with spontaneous recovery on follow-up, and no long-term hemodialysis was required. The second patient had an access site complication; a left external iliac artery (EIA) dissection was incidentally noted when cannulating the starter wire. A thorough angiography revealed non-flow-limiting dissection, and the patient was effectively managed conservatively without graft-limb thrombosis. Unintentional coverage of the internal iliac artery was observed in two other patients: one with a concomitant sole CIA aneurysm and one with an insufficient length of distal landing zone, in which the hypogastric artery was occluded with a vascular plug at the beginning of the procedure and distal sealing in the external iliac artery was required. In these two patients, incidental occlusion of the hypogastric artery on the opposite side was noted at the completion of angiography. Both patients experienced transient buttock claudication with spontaneous recovery.

Table 4 Outcomes follow up

Outcome	30 days	1 year
Clinical success	37/39 (94.9)	32/35 (91.4)
Overall Mortality	2/43 (4.7)	7/43 (16.3)
AAA-related mortality	1/43 (2.3)	1/43 (2.3)
Other causes	1/43 (2.3)	6/43 (14.0)
AAA sac diameter change		
≥ 5 mm increase	N/A	1/34
< 5 mm change	N/A	16/34
≥ 5 mm decrease	N/A	17/34
Loss to follow-up	5/43 (11.6)	9/43 (20.9)
Available postoperative imaging at 1 year	38/43 (88.4)	34/43 (79.1)
Graft-related complications*		
Endoleak	6	3
Type I	1	0
Type II	5	3
Stent graft migration	1	0
Stent graft thrombosis	0	0
Graft infection	0	0
Graft limb kinking	1	1
AAA rupture	0	0
AAA-related secondary intervention	0	1

AAA, Abdominal aortic aneurysm; N/A, not applicable.
Value is represented as number or number/number (%).
*One patient may have more than one complication.

No reinterventions were required within 30 days following the initial operation. However, five patients (11.6%) were lost to follow-up, including two who passed away within the first 30 days postoperatively. Within the first postoperative month, a total of 38 control CTAs were conducted. Among these CTAs, six endoleaks were identified, including five type II endoleaks and one type Ib endoleak. In one patient with a type II endoleak, graft-limb kinking was detected in one iliac limb without any occlusion or thrombosis. Close follow-up with either CTA or DUS was planned. In the case of the patient with a type IB endoleak, a stent graft migration exceeding 5 mm was observed on the CTA. This patient was treated with stent-graft relining in iliac limb.

One-year postoperative analysis

After one year, 34 (79.1%) patients had access to clinical follow-up and CTA imaging, as detailed in Table 4. There were nine patients who were lost to follow-up, including seven who died. Five additional patients died between the first 30 postoperative days and the 1-year follow-up. Causes of death included cardiac disease in one patient, common bile duct stone with cholangitis in one patient, sepsis caused by urinary tract infection in one patient, and renal failure in one patient. One patient died from an unknown cause, although death caused by a ruptured AAA was considered unlikely since the patient had no endoleaks on an earlier CTA.

The CTAs obtained at 1 year revealed three patients with persistent type II endoleaks. Another two patients with a type II endoleak recorded on the initial follow-up CTA had spontaneous resolution. Endoleaks by type and follow-up interval are reported in Table 5. No type I, type III, or type IV endoleaks have been reported at one year of follow-up.

Table 5 Endoleak by follow-up interval

Interval	Type Ia	Type Ib	Type II	Type III	Type IV
At completion angiogram	1	0	9	0	0
1 month (n = 38)	0	1 (2.6)	5 (13.2)	0	0
New	0	1	2	0	0
Persistent	0	0	3	0	0
1 year (n = 34)	0	0	3 (8.8)	0	0
New	0	0	0	0	0
persistent	0	0	3	0	0

Value is represented as number (%)

Between 30 days and 1-year follow-up, one patient underwent reintervention. Following the index operation, the patient had an endovascular reintervention three months later. Internal iliac artery embolization and iliac stenting extension were successfully performed in a type IB endoleak patient with stent graft migration discovered on the initial follow-up CTA. This patient's one-year follow-up CTA revealed no endoleaks or other complications. There was no stent graft fracture, thrombosis, infection, ruptured AAA, or open surgical conversion during the one-year follow-ups.

On the 34 CTAs performed after 1 year, the mean AAA diameter had decreased to 48.2 ± 14.1 (range, 22-80) mm. Compared with the preoperative values, AAA sac diameter increased ≥ 5 mm in 1 patient, remained stable (< 5 mm change) in 16 patients, and decreased in 17 patients.

Clinical success was achieved in 32 of 35 patients (91.4%) after one year. The patients with clinical failure had one type Ib endoleak that required secondary intervention, one type II endoleak with aneurysm sac growth greater than 5 mm, and one patient died as a result of AAA-related death.

Discussion

EVAR has emerged as a minimally invasive surgical technique involving the placement of a stent graft to effectively exclude the aortic aneurysm from the arterial circulation and systemic pressure. Since its initial introduction by Parodi et al. in 1991, EVAR has been universally recognized as a pioneering milestone in vascular surgery. In cases where the anatomical characteristics of the aneurysm are suitable, EVAR consistently demonstrates acceptable mortality and morbidity rates, particularly when applied to high-risk patients.

Numerous multicenter, prospective, randomized clinical studies have compared the outcomes of open surgical repair (OSR) and EVAR in terms of early, mid-term, and late-term results.[6-10] Overall, these studies have shown that EVAR offers initial advantages over OSR in terms of surgical mortality and complication rates. However, over the mid-and long-term, the benefits tend to diminish. Furthermore, a higher incidence of vascular and endograft-related complications has been reported with EVAR, necessitating a greater need for reinterventions.

During the learning curve period, the initiation of EVAR may present certain challenges. Multiple studies examining EVAR outcomes within a single cohort have reported technical success rates ranging from 86% to 100% and clinical success rates ranging from 91.6% to 97%.[15-19] Our study noted a technical success rate of 97.7% and a clinical success rate of 91.4%. These outcomes are consistent with prior research and are commensurate with results in the earlier studies

Although EVAR was originally considered for patients deemed unsuitable for extensive open surgical interventions, its utilization has progressively expanded to include patients who are appropriate candidates for major surgical procedures. Previous clinical trials have documented 30-day mortality rates spanning from 0% to 3% and one-year all-cause mortality rates spanning from 4% to 12%.[6-9,15-19] Our study revealed a 30-day mortality rate of 4.7% and a 1-year all-cause mortality rate of 16.3%, with the majority of deaths unrelated to abdominal aortic aneurysm (AAA). This relatively elevated mortality rate may be attributed to underlying comorbidities in our analysis.

Endoleak, which can lead to increased reintervention and costs. It remains a significant issue for EVAR. The Major factors affecting endoleak development are neck anatomy, a short aneurysm neck, a neck angle exceeding 60°, increased distal neck diameter, and thrombus or ulcerated plaque in the neck wall.[13,20] Several studies reported an early- and mid-term incidence of endoleak ranging from 5.6% to 22%.[11,15-19,21] In our study, we observed that the incidence of endoleak was 23.2% at the end of the procedure, 15.8% after 30 days, and 8.8% at 1 year postoperatively. There was one patient with type Ia endoleak who experienced spontaneous resolution.

Type Ib endoleak was noticed in one patient treated inside the IFU of the Endurant stent graft; the leak resolved through a reintervention. Type II endoleaks were noted in a total of 11 patients, with only one displaying an aneurysm sac enlargement exceeding 5 mm. According to current guidelines, a conservative approach is recommended for isolated type II endoleaks without sac expansion, and intervention is typically advised when sac enlargement is more than 10 mm.[22,23] In our study, it is worth highlighting that the majority of type II endoleaks spontaneously resolved, and none of the patients necessitated intervention. Nevertheless, in cases where type II endoleaks persist despite conservative management, patients have the option to undergo either endovascular procedure management or surgical correction as part of their treatment strategy. The importance of surveillance cannot be overstated, as it plays a crucial role in the early detection of complications of EVAR and ensures appropriate management of patients undergoing treatment. The surveillance of patients is essential for optimizing their overall care and minimizing the risks associated with their treatment.

Limitations of this study include the retrospective, single-center design with a small sample size, so it was unable to analyze the variables with statistical methods. Nonetheless, the principle aim of this study was to evaluate the one-year postoperative outcomes within the learning curve of the EVAR procedure and establish that our results align with those reported in other studies in the field.

In conclusion, EVAR can be successfully performed at Rajavithi Hospital, as demonstrated by our study, which has shown high success and low AAA-related mortality rates. Nevertheless, it is imperative to underscore the significance of vigilant post-procedural surveillance. This ongoing monitoring is essential for the timely identification and efficient management of any potential complications that may emerge.

Conflict of interest

No authors have any potential conflict of interest to disclosure.

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