Factors Predicting 30-Day Mortality in Rupture Abdominal Aortic Aneurysm Treating with Endovascular Aneurysm Repair

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Background: *Endovascular aneurysm repair had become the first line treatment in rupture abdominal aortic aneurysm(rAAA).*
Objective: *To evaluate factors predicting 30-day mortality in rupture abdominal aortic aneurysm(rAAA) treated with endovascular abdominal aortic aneurysm repair (rEVAR). Secondary outcome measured the mortality in rEVAR compared with open surgical repair (rOSR).*
Material and Method: *The data was retrospectively collected from May 2013-December 2016 in the patients treated with rEVAR. Stata v.14 (Stata Corp.TX.USA) was used for all statistical analyses.*
Results: *44 patients diagnosed with ruptured abdominal aortic aneurysm (rAAA) were included and treated with rEVAR. Three patients (6%) were suprarenal aortic aneurysm, 11 patients (25%) were diagnosed juxtarenal aortic aneurysm, 2 patients (5%) were thoracoabdominal aortic aneurysm and 28 patients (64%) were infrarenal aortic aneurysm. Hardman score was more than or equal to 3 in 11 patients (25%). The mean diameter of abdominal aortic aneurysm size was 78 mm. (±18.13). Twenty-six patients (59%) had hostile neck and 27 patients (61%) were implemented adjunctive procedures. Fourteen of 44 patients (31.82%) were dead in perioperative period. Using aortic occlusion balloon(AOB) was the only factor predicting mortality in rEVAR (p = 0.006). The research identified no significant perioperative mortality between rEVAR and rOSR (31.82% vs. 36.36% p = 0.712). Focusing on the renal outcome, preserving two renal arteries group showed lower post-operative hemodialysis than preserving one or non-renal artery group (p = 0.022).*
Conclusion: *Factor predicting 30-day mortality in rEVAR was aortic balloon occlusion. The 30-day mortality between rEVAR and rOSR was not significantly different. Although hostile neck did not influence the perioperative mortality, it indicated not only the more adjunctive procedure including chimney and covering renal arteries but also the postoperative hemodialysis.*

Keywords: *Rupture abdominal aortic aneurysm, Endovascular aneurysm repair, EVAR, Aortic occlusion balloon, Open aneurysmorrhaphy*

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Abdominal aortic aneurysm (AAA) has widely been known as a degenerative disease that became increasing with age. Perioperative mortality rate for non-rupture AAA treating with open surgical repair was 4.2%[1]. Open surgical repair (OSR) carried significant morbidity and mortality, due to the combination of effects occurred in surgical exposure, hemorrhage and aortic clamping with related lower torso ischemia-reperfusion injury[2]. In contrary, endovascular abdominal aortic aneurysm repair(EVAR) had lower short-term mortality around 1.4% in patients who considered fit for surgery. However, this benefit from EVAR did not persist at the intermediate and long-term follow-up[1]. Therefore, EVAR allowed repair in patients with significant concomitant medical disease who might otherwise have been considered unfit for surgery[2].

During emergency situation, the extremely high mortality rate of ruptured abdominal aortic aneurysm (rAAA) was well recognized. Most rAAA patients died at scene immediately. Perioperative mortality rate for open surgical repair of rAAA (rOSR) ranged from 40% to 50%[3,4]. A recent minimally invasive technique, termed endovascular treatment (rEVAR) allowed the surgeon to control the bleeding quickly

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minimizing the blood loss and complications. Therefore, the treatment in rAAA had become a shift towards rEVAR[5]. Single centre series suggested rEVAR in reducing mortality rate compared with rOSR. Three RCTs failed to demonstrate the superiority of rEVAR over open repair[2,5,7-9]. In Thai patients, factors predicting mortality had not been evaluated in rEVAR, thus, these factors should be identified for prediction in order to improve patient selection.

Objective

The purpose of this study evaluated primarily on the factors predicting 30-days mortality in rAAA treating with rEVAR. Secondary outcome measured the mortality in rEVAR compared with rOSR.

Material and Method

Retrospective cohort study collected from May 2013 to December 2016. The study protocol was approved by the hospital's Institutional Review Board. The inclusion criteria were the patients who were diagnosed rAAA and stayed alive on the arrival at Ramathibodi Hospital including infrarenal, juxtarenal, suprarenal and thoracoabdominal aortic aneurysm. We excluded the patients who were not diagnosed ruptured abdominal aortic aneurysm at the time of arrival in Ramathibodi hospital and rupture thoracic aortic aneurysm. We collected the data such as risk factors including diabetes mellitus, hypertension, smoking, coronary artery disease, renal dysfunction, and pulmonary dysfunction. Other data including anatomy of aneurysm, operative and postoperative characteristics were recorded prospectively in the database and analyzed as part of this study.

Definition

We defined ruptured abdominal aortic aneurysm as the patient who had peri-aortic hematoma on the immediate preoperative CTA or extravasation on aortography[10]. Patient with loss of consciousness or preoperative cardiopulmonary resuscitation (CPR) or systolic blood pressure (SBP) less than or equal to 80 mmHg were determined as unstable patient. Hardman score had been known as a set of five independent preoperative factors associated with mortality. Each 1 point for either age (> 76 years), creatinine level (>0.19 mmol/L), loss of consciousness after arrival, hemoglobin (<9 g/dL), or electrocardiographic ischemia was calculated. According to the instructions for the use of the commercially available standard endografts; minimal requirements[11], we defined hostile neck as neck length <10 mm, neck diameter >32 mm and neck angle >60 degree. Early mortality was defined by in-hospital mortality or death within 30 days of the procedure regardless of the cause. Primary technical success according to SVS/AAVS for rEVAR defined as aortic graft could exclude the flow from aneurysm sac with no surgical conversion or death, no type I or III endoleak and no graft limb occlusion[4,6].

Procedure

In Ramathibodi hospital, we developed protocol called Fast tract for ruptured abdominal aortic aneurysm as Fig. 1. When we were notified for treating the case diagnosed rAAA, we activated all the team such as anesthesiologist, scrub nurse, emergency room, radiologist, blood blank, nurse and preparing the devices. For the resuscitation, we used the hypotensive resuscitation as Fig. 1.

On Ramathibodi Hospital arrival, if the patients with no previous computer angiography (CTA) was stable, we would send the patients to perform CTA whereas those who were unstable, we would send them directly to the operating room. For unstable patients or stable patients with previous CTA, we immediately sent the patients to operative room. In the operative room, we promptly prepared wire, selective catheter, 12-14 Fr sheath 45 cm and 2 aortic balloons in case of hemodynamic unstable.

In stable vital sign case with neck more than 10 mm we primarily performed bifurcated graft in standard technique. If the neck was less than 10 mm, we would perform chimney endovascular aneurysm repair (chEVAR) (Fig. 2).

On the other hand, unstable vital sign patients with neck more than 10 mm, we proceeded aorto-uni

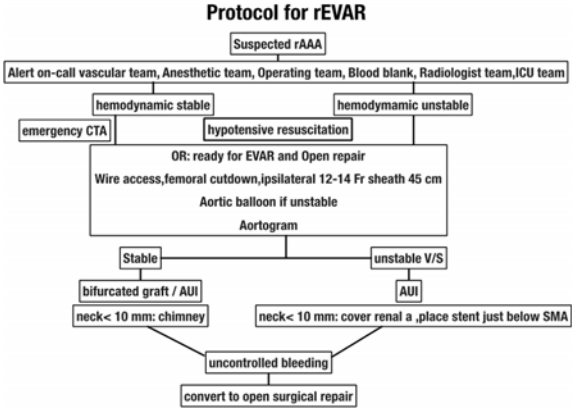

Fig. 1 Flow chart of fast tract for rAAA.

iliac (AUI) graft. If the neck was less than 10 mm we would extend neck length by covering renal artery (Fig. 3). In case that we faced with covering superior mesenteric artery (SMA), we would perform chimney SMA and cover both renal arteries (Fig. 4). If the patient was unstable in intraoperative period, we would inflate the aortic occlusion balloon. After performing rEVAR, if we could not control bleeding, we would convert to open aneurysm repair.

Statistical analysis

We used t-test or rank test for testing quantitative data between groups. Fisher's exact test was used for categorical data. Factors associated with hospital mortality were identified using logistic regression models. Statistical significance was defined as a *p*-value <0.05. Stata v. 14 (Stata Corp, TX, USA) was used for all statistical analyses.

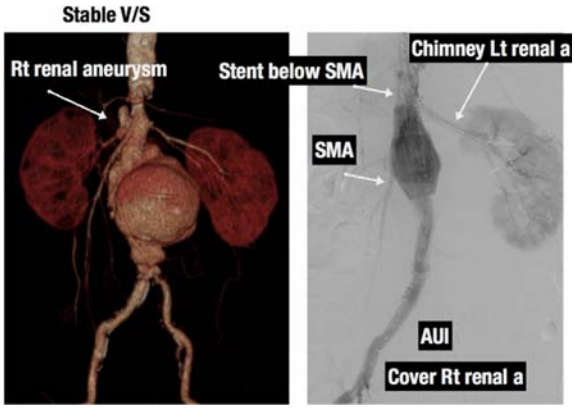

Fig. 2 Rupture infected AAA involved right renal artery with stable vital sign. Operation: Chimney left renal artery, covered right renal artery and placed the stent graft below superior mesenteric artery (SMA).

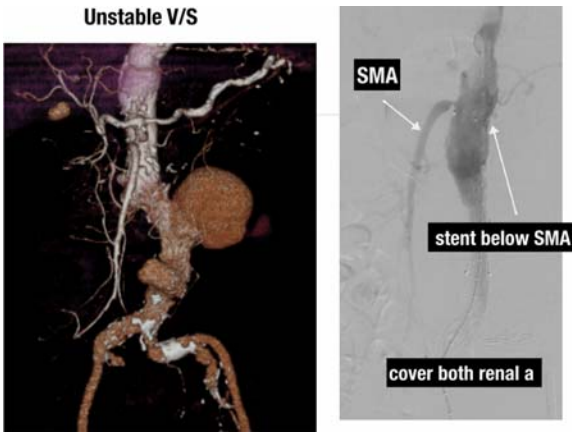

Fig. 3 Rupture juxtarenal AAA with unstable vital sign, neck length from right renal artery 6mm. left renal artery 9 mm, SMA 16 mm. Operation: placed aortouniiliac (AUI) stent graft below SMA and covered both renal artery.

Results

From May 2013 to December 2016, 44 patients were diagnosed rAAA and all the patients underwent rEVAR (100%) at our institution. The study sample of rAAA included 35 male patients (80%) and 9 female patients (20%). Of 44 patients, age more than or equal to 80 year was 16 (36%). Twenty-nine patients (66%) were unstable vital sign including 13 patients (30%) of loss of consciousness, 29 patients (66%) of SBP less than or equal to 80 mmHg and 6 patients (14%) of preoperative CPR. The mean age for the ruptured AAA patients was 75 ($\pm$9.45) years old, the mean baseline GFR was 53.22 ($\pm$35.58) mg/dL, and the mean hemoglobin was 9.21 ($\pm$2.57) g/dL. Hardman score more than or equal to 3 in 11 patients (25%). In the anatomy of AAA, we included 26 patients (59%) who had hostile neck and performed adjunctive procedure in 27 patients (61%). Three patients (6%) were suprarenal aortic aneurysm, 11 patients (25%) were diagnosed juxtarenal aortic aneurysm, 2 patients (5%) were thoracoabdominal aortic aneurysm. The mean diameter of aortic aneurysm was 78.2 mm ($\pm$18.13). Eight patients (20%) were diagnosis Infected AAA. There were 5 patients who were positive hemoculture; 1 Samonella,1 gram positive cocci, 1 Staphylococcus agalatiae, 1 Staphylococcus

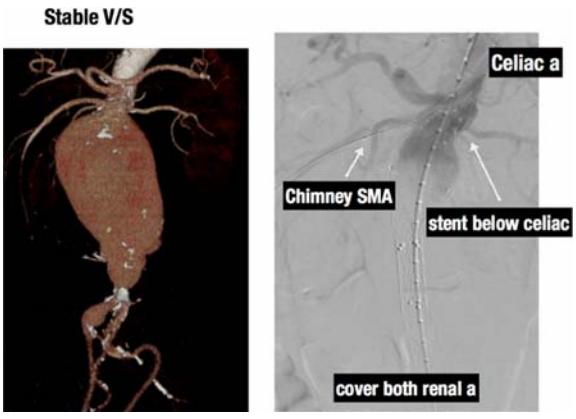

Fig. 4 Rupture juxtarenal AAA with stable vital sign which level of both renal artery and SMA were the same (neck length from both renal artery and SMA 6 mm, celiac artery 20 mm). Operation: Chimney SMA and covered both renal a and placed stent below celiac artery.

aureus, and 1 Group B Strephylococcus. We found 3 patients who diagnosed with clinical sepsis and CTA finding. The details of baseline characteristics of ruptured abdominal aortic aneurysm and anatomical characteristics were shown in Table 1.

For the intraoperative details, the mean blood loss was 2,316 ml (100-25,000), the mean operative time was 281 min (±101.15), and the mean contrast use was 117.17 ml (±54.2). We performed aortic occlusion balloon (AOB) in 15 patients (34%). The primary success of the procedure was 40 patients (91%). The details of operative procedure and adjunctive procedure were shown in Table 2 and 3. We converted to rOSR in 5 patients (11%). The character and the operation including the cause of death of these patients were shown in Table 4.

In our series, the most complications occurred after the procedure were respiratory complication (n = 26, 59%), renal complication (n = 25, 57%) and cardiac complication (n = 20, 45%) respectively. The most common re-intervention procedures were tracheostomy (n = 5, 11%) and abdominal compartment syndrome (n

Table 1. Univariate analysis of demographic, preoperative characteristic factors and anatomic characteristics of abdominal aortic aneurysm associated 30-day mortality of ruptured abdominal aortic aneurysm treated with Endovascular Aneurysm Repair (EVAR)

Variable	Alive (n = 30)	Death (n = 14)	OR (95% CI)	*p*-value
Demographic and preoperative characteristic				
Age (year), median (IQR)	76.5 (68 to 82)	75.5 (67 to 84)	1.01(0.94-1.08)	0.756
Sex: male	24 (80)	11(78.57)	1.09(0.22-5.18)	0.913
Diabetic mellitus	8 (26.67)	1(7.14)	0.21(0.02-1.89)	0.164
Hypertension	21(70)	9(64.29)	0.77(0.20-2.96)	0.705
Smoking	17(56.67)	5(35.71)	0.42(0.11-1.58)	0.200
COPD	5(16.67)	0(0)	-	-
GFR (mg/dL), mean (±SD)	54(±34.47)	48(±41.76)	0.99(0.93-1.05)	0.673
Hemoglobin (g/dL), mean (±SD)	9.51(±2.44)	8.53(±2.81)	0.85(0.65-1.12)	0.253
Hardman score ≥3	5(16.67)	6(42.86)	3.75(0.90-15.66)	0.070
Unstable vital sign	19(63.33)	10(71.43)	1.45(0.37-5.74)	0.599
Loss of consciousness	7(23.33)	6(42.86)	2.46(0.64-9.55)	0.192
SBP ≤80 mmHg	19(63.33)	10(71.43)	0.69(0.17-2.74)	0.599
Preoperative CPR	2(6.67)	4(28.57)	5.6(0.89-35.42)	0.067
Infected AAA	7(23.33)	1(7.14)	0.25(0.28-2.29)	0.221
Anatomical characteristics of abdominal aortic aneurysm				
Location:				
Infrarenal	21(70)	7(50)	-	-
Juxtarenal	6(20)	5(35.71)	2.5(0.58-10.80)	0.220
Suprarenal	2(6.67)	1(7.14)	1.5(0.12-19.18)	0.755
Thoracoabdminal	1(3.33)	1(7.14)	3(0.16-54.57)	0.458
Neck:				
Diameter (mm); median (±SD)	24.1(±4.44)	23.36(±6.72)	0.97(0.84-1.11)	0.677
Length (below the lowest renal a) (mm), median (IQR)	21.5(10-30)	10(10-50)	1.02(0.98-1.06)	0.387
Angulation (degree), mean (±SD)	49.06(±35.42)	49.54(±42.80)	1.00(0.98-1.02)	0.970
Hostile neck	18(60)	8 (66.67)	1.33(0.33-5.43)	0.688
Landing:				
CIA diameter (mm), median (IQR)	13(10-15)	13 (11-20)	0.10(0.94-1.05)	0.901
CIA length (mm), median (IQR)	39(30-47)	36(30-46)	1.00(0.96-1.05)	0.978
Distal landing at CIA	23(76.67)	6(46.15)	3.29(0.80-13.50)	0.099
Aortic bifurcation (mm), median (IQR)	21(18-27)	21(15-30)	0.97(0.90-1.05)	0.441
Access:				
Diameter (mm), mean (±SD)	8.34(±0.97)	8.54(±1.03)	1.24(0.60-2.56)	0.560
Aneurysm diameter (mm), mean (±SD)	77.7(±19.27)	79.7(±14.94)	1.006(0.97-1.05)	0.760

Table 2. Univariate analysis of operative procedure associated 30-day mortality of ruptured abdominal aortic aneurysm treated with Endovascular Aneurysm Repair (EVAR)

Variable	Alive (n = 30)	Death (n = 14)	OR (95% CI)	*p*-value
Operative procedure				
Aortouni-iliac graft	22 (73.33)	13 (92.86)	0.21 (0.02 to 1.89)	0.121
Aortic balloon occlusion	6 (20)	9 (64.29)	7.2 (1.75 to 29.57)	0.006
Primary success	30 (100)	10 (71.43)	-	-
Convert to open surgery	0 (0)	5 (35.71)	-	-
Operative time (min), mean (±SD)	269.46 (±102.84)	305.71 (±96.33)	1.00 (0.99 to 1.01)	0.268
Preserve internal iliac artery (IIA)				
Two IIA	20 (73.33)	5 (41.67)	-	-
One IIA	6 (20)	5 (41.67)	3.67 (0.79 to 16.99)	0.097
None	2 (6.67)	2 (16.63)	4.4 (0.49 to 39.21)	0.184
Contrast use (ml), median (IQR)	98.5 (75 to 125)	135 (94 to 165)	1.01 (0.99 to 1.02)	0.192
Type of anesthesia: GA	27 (90)	11 (78.57)	0.41 (0.71 to 2.34)	0.314
Adjunctive procedure	18 (60)	9 (64.29)	1.20 (0.32 to 4.47)	0.786
Blood loss (ml), median (IQR)	850 (400 to 1,000)	1,900 (1,000 to 5,000)	1.00 (0.99 to 1.00)	0.053

Table 3. Details of adjunctive procedures

Variable	Total
Explore lap with aortic banding	2
Aortic extension	7
Chimney one renal a.	1
Chimney two renal a.	1
Chimney SMA	1
Cover one renal a.	1
Cover two renal a.	4
TEVAR	1
PTA iliac	4
Explore lap	2
Palmaz stent	1
Bilateral AUI	1
Graft thrombectomy	1
SMA bypass	1
Iliac conduit	1

= 5, 11%). The details of complications and re-interventions after rEVAR were shown in Table 5.

There were 14 patients (31.8%) who were dead within 30-day after rEVAR. Overall, the median length of hospital stay was 10 days (2-31) and the median ICU stay was 4 (1-13) days. The causes of deaths were multi organ failure in 14 patients (93.3%), and cerebral infarction in one patient (6.7%). We found the aortic occlusion balloon was the only factor significantly affected to 30-day mortality after rEVAR (95% CI 7.2; 1.75-29.57, $p = 0.006$) showed in Table 6. From subgroup analysis in unstable and stable vital sign patients, AOB was associated 30-day mortality only in vital sign unstable.

Focusing on renal outcome in patients classified by the procedure, preserving two renal arteries group had less post-operative hemodialysis than preserving one or non-renal artery group (Table 7).

Discussion

The trend of rEVAR had been increasing and becoming the first line treatment of rAAA. Comparing 44 patients treating with rEVAR from May 2013 to December 2016 with 22 patients histologically treating with rOSR for treatment rAAA from January 2007 to April 2013, the 30-day mortality was not significantly different (31.82% vs. 36.36%, $p = 0.712$). The result of our study was paralleled to the others[7-9,12,13] in the term of 30-day mortality which ranged from 13.9% to 53% for rEVAR.

This research found only AOB significantly influenced 30-day mortality in rEVAR. It was not surprising because using AOB referred to unstable rAAA or impending circulatory collapse during the operation which was considered as the poor prognosis. Supported by subgroup analysed in unstable and stable vital sign patients showed in Table 6, AOB was associated 30-day mortality only in vital sign unstable. Whereas meta-analytical evidence[18] showed the use of AOB in unstable RAAA patients might improve the results. Our outcome that differed from the others[18] might be impacted by the selection bias and AOB technique. Although Hardman score ≥3 ($p = 0.070$),

Table 4. The character, operation and cause of death of the patients who were converted to rOSR

Patient	Vital sign	Hardman score	Lesion	Operation	Aortic balloon	Reason to convert/ operation to correct	Cause of death
84 year Female	Unstable	3	Juxtarenal	AUI/fem-fem	Yes	Endoleak type I/ Aortic banding	Multiorgan failure
85 year Female	Unstable	3	Infrarenal	AUI/fem-fem	Yes	Severe ACS/ Explore lap with closure aneurysmal perforated site	Multiorgan failure
67 year Male	Unstable	3	Suprarenal	AUI/fem-fem	Yes	Endoleak type I/ Aortic banding	Multiorgan failure
81 year Male	Unstable	4	Infrarenal	AUI/fem-fem	Yes	Severe ACS/ Explore lap with closure aneurysmal perforated site	Multiorgan failure
74 year Female	Stable	1	Thoraco-abdominal	TEVAR/SMA bypass	No	Incidentally cover SMA/ Explore lap with SMA bypass	Multiorgan failure

ACS = Abdominal compartment syndrome

Table 5. The details of complications and re-interventions after rEVAR

Variable	Alive (n = 30)	Death (n = 14)	OR (95% CI)	*p*-value
Complication	14 (46.67)	6(42.86)	0.86(0.24-3.08)	0.813
Cardiac	12 (40)	8(57.14)	2.00(0.55-7.24)	2.291
Respiratory	17 (56.67)	9(64.29)	1.38(0.37-5.10)	0.633
Renal	15(50)	10(71.43)	2.50(0.64-9.77)	0.188
Hemodialysis	10(33.33)	2(14.29)	0.33(0.62-1.79)	0.200
Liver	6(20)	2(14.29)	0.67(0.12-3.81)	0.649
Ischemic colitis	6(20)	0	-	-
Spinal cord ischemia	1(3.33)	0	-	-
Abdominal compartment syndrome	5(16.67)	6(42.86)	3.75(0.90-15.66)	0.070
Acute limb ischemia	2(6.67)	0	-	-
Reason for re-intervention	6(20)	0	-	-
Control bleeding	0	0	-	-
Acute limb ischemia	2(6.67)	0	-	-
Ischemic colitis	2(6.67)	0	-	-
Abdominal compartment syndrome	5(16.67)	0	-	-
Tracheostomy	5(16.67)	0	-	-

Table 6. Subgroup analysis in AOB

Variable	Alive (n = 30)	Death (n = 14)	OR (95% CI)	*p*-value
Aortic occlusion balloon	6 (20)	9 (64.29)	7.2 (1.75 to 29.57)	0.006
Unstable	5 (26.32)	8 (80)	11.2 (1.75 to 71.64)	0.011
Stable	1 (9.09)	1 (25)	3.33 (0.16 to 70.91)	0.440

Table 7. Renal outcomes after the procedure

Variable	Non HD (n = 32)	HD (n = 12)	OR (95% CI)	*p*-value
Preserve renal a			6.90 (1.32 to 36.03)	0.022
Two renal a	29(90.63)	7(58.33)		
One or none renal a	3(9.38)	5(41.67)		

blood loss ($p = 0.055$), preoperative CPR ($p = 0.067$) and abdominal compartment syndrome ($p = 0.070$) were not statistically significant affected the 30-day mortality in rEVAR, they would be considered high tendency factors affected mortality. These may be due to the limit number of patients.

In term of research protocol comparing to other studies[7-9,12-15], this study was quite different. Mehta et al[15] had analysed the anatomy of rupture AAA cases. Most (85%) were suitable for endovascular repair if the inclusion criteria were modified to include aortic neck length of 10 mm and neck diameter of 30 mm. Comparing to our series, most (60%) were hostile neck. All of our patients, even though they had unfavourable neck, we still proceeded EVAR with adjunctive procedure such as chimney EVAR for stable patients or cover renal artery for unstable patients. It could be concluded that there were more hostile neck patients in our series, however the 30-day mortality showed no difference.

Contrary to the other studies[9,16,17], the anatomical factors did not influence the 30-day mortality. There were many studies reported the negative effects of hostile neck on rEVAR. However, in our series, hostile neck was not affected perioperative mortality in rEVAR (60% vs. 66.67%; $p = 0.688$). This result was paralleled to the location of aneurysm comparing infrarenal to non infrarenal AAA (7% vs. 7%; $p = 0.204$). This result might due to the limit number of the patients and the different protocol that possibly affected the outcome. The hostile neck patients needed the adjunctive procedure to prevent and treat the endoleak type Ia. In stable patient, chimney EVAR could preserve renal artery and SMA. Contrary to unstable patient, SMA was the only vessel that had to be preserved so the renal arteries were covered. In subgroup analysis focusing on renal function showed that preserving two renal arteries were better than preserving one or non-renal artery in post-operative hemodialysis outcome. These results made the conclusion that hostile neck did not influence the perioperative mortality in rAAA who treated with rEVAR, but it referred to the more adjunctive procedure including chimney and covering renal arteries that influenced the need of postoperative hemodialysis.

We developed this protocol for four reasons. First, to avoid the two hits hypothesis from the ischemia and reperfusion injury from rOSR. Second, time to hemostasis was also important. The third reason was less blood loss for EVAR. Lastly, unstable vital sign patients who had hostile neck could survive from rAAA by endovascular mean by intention to cover renal artery and then hemodialysis to save the life. These results could get along with the principle of emergent treatment, save life first.

There were some limitations of our studies including the limit number of the patients and retrospective study. Some data could not be collected in the emergency situation. The exclusion criteria in this study was not identified the characters of the patients that might not be suitable to operate such as severe comorbidity, hemodynamic collapse and difficult anatomy. Regarding to our data that we treated all of the patients who were diagnosed rAAA with rEVAR (100%).

Conclusion

Factor predicting 30-day mortality in rEVAR was aortic balloon occlusion reflecting on impending circulatory collapse of the patients. The 30-day mortality between rEVAR and rOSR was not significantly different. Although hostile neck did not influence the perioperative mortality, it indicated not only the more adjunctive procedure including chimney and covering renal arteries but also the need of postoperative hemodialysis.

What is already known on this topic?

The outcomes of rEVAR and rOSR on the 30-day mortality were not different. There were many factors predicting 30-day mortality in rAAA. But there were few in Thailand.

What this study adds?

Although hostile neck did not influence the perioperative mortality, it indicated not only the more

adjunctive procedure including chimney and covering renal arteries but also the post operative hemodialysis. AOB was the predicting 30-day mortality factor in Thai patients.

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Potential conflicts of interest

None.

References

1. Bown MJ, Sutton AJ, Bell PR, Sayers RD. A meta-analysis of 50 years of ruptured abdominal aortic aneurysm repair. Br J Surg 2002; 89: 714-30.
2. Cho JS, Kim JY, Rhee RY, Gupta N, Marone LK, Dillavou ED, et al. Contemporary results of open repair of ruptured abdominal aortoiliac aneurysms: effect of surgeon volume on mortality. J Vasc Surg 2008; 48: 10-7.
3. Pini R, Faggioli G, Longhi M, Mauro R, Freyrie A, Gargiulo M, et al. The influence of study design on the evaluation of ruptured abdominal aortic aneurysm treatment. Ann Vasc Surg 2014; 28: 1568-80.
4. Badger SA, Harkin DW, Blair PH, Ellis PK, Kee F, Forster R. Endovascular repair or open repair for ruptured abdominal aortic aneurysm: a Cochrane systematic review. BMJ Open 2016; 6: e008391.
5. Paravastu SC, Jayarajasingam R, Cottam R, Palfreyman SJ, Michaels JA, Thomas SM. Endovascular repair of abdominal aortic aneurysm. Cochrane Database Syst Rev 2014; (1): CD004178.
6. Chaikof EL, Blankensteijn JD, Harris PL, White GH, Zarins CK, Bernhard VM, et al. Reporting standards for endovascular aortic aneurysm repair. J Vasc Surg 2002; 35: 1048-60.
7. Reimerink JJ, Hoornweg LL, Vahl AC, Wisselink W, van den Broek TA, Legemate DA, et al. Endovascular repair versus open repair of ruptured abdominal aortic aneurysms: a multicenter randomized controlled trial. Ann Surg 2013; 258: 248-56.
8. Hinchliffe RJ, Bruijstens L, MacSweeney ST, Braithwaite BD. A randomised trial of endovascular and open surgery for ruptured abdominal aortic aneurysm - results of a pilot study and lessons learned for future studies. Eur J Vasc Endovasc Surg 2006; 32: 506-13.
9. Powell JT, Sweeting MJ, Thompson MM, Ashleigh R, Bell R, Gomes M, et al. Endovascular or open repair strategy for ruptured abdominal aortic aneurysm: 30 day outcomes from IMPROVE randomised trial. BMJ 2014; 348: f7661.
10. Saqib N, Park SC, Park T, Rhee RY, Chaer RA, Makaroun MS, et al. Endovascular repair of ruptured abdominal aortic aneurysm does not confer survival benefits over open repair. J Vasc Surg 2012; 56: 614-9.
11. Moll FL, Powell JT, Fraedrich G, Verzini F, Haulon S, Waltham M, et al. Management of abdominal aortic aneurysms clinical practice guidelines of the European society for vascular surgery. Eur J Vasc Endovasc Surg 2011; 41 (Suppl 1): S1-58.
12. Verhoeven EL, Kapma MR, Groen H, Tielliu IF, Zeebregts CJ, Bekkema F, et al. Mortality of ruptured abdominal aortic aneurysm treated with open or endovascular repair. J Vasc Surg 2008; 48: 1396-400.
13. Nedeau AE, Pomposelli FB, Hamdan AD, Wyers MC, Hsu R, Sachs T, et al. Endovascular vs open repair for ruptured abdominal aortic aneurysm. J Vasc Surg 2012; 56: 15-20.
14. Mehta M. Technical tips for EVAR for ruptured AAA. Semin Vasc Surg 2009; 22: 181-6.
15. Mehta M, Taggert J, Darling RC 3rd, Chang BB, Kreienberg PB, Paty PS, et al. Establishing a protocol for endovascular treatment of ruptured abdominal aortic aneurysms: outcomes of a prospective analysis. J Vasc Surg 2006; 44: 1-8.
16. Richards T, Goode SD, Hinchliffe R, Altaf N, Macsweeney S, Braithwaite B. The importance of anatomical suitability and fitness for the outcome of endovascular repair of ruptured abdominal aortic aneurysm. Eur J Vasc Endovasc Surg 2009; 38: 285-90.
17. Barnes R, Kassianides X, Barakat H, Mironska E, Lakshminarayan R, Chetter IC. Ruptured AAA: suitability for endovascular repair is associated with lower mortality following open repair. World J Surg 2014; 38: 1223-6.
18. Karkos CD, Papadimitriou CT, Chatzivasileiadis TN, Kapsali NS, Kalogirou TE, Giagtzidis IT, et al. The impact of aortic occlusion balloon on mortality after endovascular repair of ruptured abdominal aortic aneurysms: A meta-analysis and meta-regression analysis. Cardiovasc Intervent Radiol 2015; 38: 1425-37.

ปัจจัยเสี่ยงต่อการเสียชีวิต 30 วันหลังการรักษาในคนไข้ที่เป็นหลอดเลือดแดงใหญ่ในช่องท้องโป่งพองแตกที่รักษาโดยการใส่ขดลวดในหลอดเลือดแดงใหญ่ (rEVAR)

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ภูมิหลัง: ในปัจจุบันการใส่ขดลวดในหลอดเลือดแดงใหญ่ (rEVAR) กลายมาเป็นการรักษาอันดับแรกในคนไข้ที่เป็นหลอดเลือดแดงใหญ่ในช่องท้อง โป่งพองแตก (rAAA)

วัตถุประสงค์: เพื่อศึกษาปัจจัยเสี่ยงที่มีผลต่อกรเสียชีวิต 30 วัน หลังการรักษาผู้ป่วยโรคหลอดเลือดแดงใหญ่ในช่องท้องโป่งพองแตกโดยการใส่ขดลวดในหลอดเลือดแดงใหญ่ endovascular abdominal aortic aneurysm repair (rEVAR) วัตถุประสงค์รองเพื่อเปรียบเทียบผลการรักษาระหว่างการใส่ขดลวด ในหลอดเลือดแดงใหญ่ (rEVAR) กับการผ่าตัด open surgical repair (rOSR) ในด้านอัตราการเสียชีวิตภายใน 30 วันหลังการผ่าตัด

วัสดุและวิธีการ: เป็นการศึกษาแบบ retrospective cohort study โดยเก็บข้อมูลย้อนหลังของผู้ป่วยที่ได้รับการวินิจฉัยว่าเป็นโรคหลอดเลือดแดงใหญ่แตกที่มาถึงโรงพยาบาลรามาธิบดีที่ได้รับการรักษาด้วยการใส่ขดลวดในหลอดเลือดแดงใหญ่ตั้งแต่ เดือนพฤษภาคม พ.ศ. 2556 ถึง เดือนธันวาคม พ.ศ. 2559 โดยใช้ Stata v.14 (StataCorp. TX. USA) ในการคำนวณทางสถิติ

ผลการศึกษา: คนไข้ 44 คน ได้รับวินิจฉัยว่าเป็นหลอดเลือดแดงใหญ่ในช่องท้องโป่งพองแตกและได้รับการรักษาโดยการใช้ขดลวด (rEVAR) มีคนไข้ 3 คน (6%) มีหลอดเลือดแดงโป่งพองที่ลามไปถึงเส้นเลือดที่ไปเลี้ยงไต (Suprarenal AAA) คนไข้ 11 คน (25%) มีหลอดเลือดแดงโป่งพองที่ลามไปจนเกือบถึงเส้นเลือดที่ไปเลี้ยงไต (Juxtarenal AAA) คนไข้ 2 คน (5%) มีหลอดเลือดแดงโป่งพองที่ลามไปจนถึงเส้นเลือดที่ไปเลี้ยงลำไส้และลามไปถึงหลอดเลือดแดงใหญ่ในช่องอก (Thoracoabdominal AAA) คนไข้ 28 คน (64%) มีหลอดเลือดแดงโป่งพองที่อยู่ใต้ไตโดยคนไข้ 11 คน (25%) ที่มีคะแนนของ Hardman score ที่มากกว่าหรือเท่ากับ 3 โดยขนาดของหลอดเลือดแดงโป่งพองในช่องท้องมีขนาดค่าเฉลี่ย 78 มิลลิเมตร (±18.13) คนไข้ 26 คน (59%) ที่มีบริเวณที่วางขดลวดจะไม่เหมาะสม (hostile neck) ในขณะที่คนไข้ 27 คน (61%) ที่ได้รับ การทำหัตถการต่าง ๆ เพิ่มเติมจากการใส่ขดลวดแบบมาตรฐาน (Adjunctive procedure) มี 14 คน จาก 44 คน (31.82%) ที่เสียชีวิตหลังการรักษา ภายใน 30 วัน (perioperative mortality) การใช้บอลลูนในหลอดเลือดแดงใหญ่เพื่อหยุดเลือดออก (aortic occlusion balloon) เป็นเพียงปัจจัยเดียวที่มีผลต่อการเสียชีวิตหลังการรักษาด้วยการใส่ขดลวด ($p = 0.006$) โดยงานวิจัยนี้ไม่พบความแตกต่างอย่างมีนัยสำคัญทางสถิติของอัตราการเสียชีวิตภายหลังการรักษา (perioperative mortality) ระหว่างการรักษาโดยใช้ขดลวด (rEVAR) กับการรักษาโดยการผ่าตัด (rOSR) (31.82% vs. 36.36% $p = 0.712$) โดยถ้าพิจารณาจากผลกระทบต่อไตจะพบว่าการที่สามารถรักษาเส้นเลือดที่ไปเลี้ยงไตได้สองเส้นจะมีโอกาสต้องฟอกไตหลังการผ่าตัดน้อยกว่ารักษาเส้นเลือดไปเลี้ยงไตได้เพียงหนึ่งเส้นหรือไม่สามารถเก็บเส้นเลือดไปเลี้ยงไตได้เลย ($p = 0.022$)

สรุป: ปัจจัยที่มีผลต่ออัตราการเสียชีวิต 30 วัน หลังผ่าตัดในคนไข้ที่ได้รับวินิจฉัยว่าเป็นหลอดเลือดแดงใหญ่ในช่องท้องโป่งพองแตก และได้รับการรักษา โดยการใช้ขดลวด (rEVAR) คือการใช้บอลลูนในหลอดเลือดแดงใหญ่เพื่อหยุดเลือดออก (aortic occlusion balloon) ซึ่งแสดงถึงภาวะของคนไข้ก่อนผ่าตัดว่ามีภาวะระบบไหลเวียนเลือดที่ล้มเหลว ไม่พบความแตกต่างอย่างมีนัยสำคัญทางสถิติของอัตราการเสียชีวิตภายหลังการรักษา (perioperative mortality) ระหว่างการรักษาโดยใช้ขดลวด (rEVAR) กับการรักษาโดยการผ่าตัด (rOSR) ถึงแม้ว่าบริเวณที่วางขดลวดจะไม่เหมาะสมในบางราย (hostile neck) แต่ก็ไม่มีผลต่ออัตราการเสียชีวิตหลังผ่าตัดภายใน 30 วัน แต่มีผลต่อการทำหัตถการต่าง ๆ เพิ่มเติมจากการใส่ขดลวดแบบมาตรฐาน (Adjunctive procedure) เช่น ใส่ขดลวดเข้าไปในเส้นเลือดไตและปิดเส้นเลือดไต ซึ่งมีผลต่อการฟอกไตหลังผ่าตัด