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Original Article

One Hundred and One Open Abdominal Aortic Aneurysm Repairs: 5 Years' Experience at Lampang Regional Hospital, Thailand

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Abstract

Objective: **To delineate the natural presentation of abdominal aortic aneurysm (AAA) patients in Lampang Regional hospital and audit the results of open AAA repair performed by one surgeon over a 5-year period.**

Methods: **A survey of 101 consecutive AAA patients during August 2005 and August 2010 was performed. Outcomes included hospital death, major complication, co-morbidity and causes of death after AAA repair.**

Results: **Among the 101 AAA patients, 66 (65%) underwent elective repair. Nine (9%) cases had ruptured AAA (1 case of free rupture, 8 cases of contained rupture). Twenty-six (26%) patients underwent urgent repair for the symptomatic AAA, including 7 (27%) with distal embolization causing limb and toe gangrene that required further amputation, 5 (19%) with aortoenteric fistula, 1 (3%) with thrombosed AAA, 6 (23%) with inflammatory AAA, 5 (19%) with infected AAA, 2 (7%) with infected previous aortic graft, and 3 (11.5%) with painful AAA of unknown cause. The 30-day hospital deaths included 2 patients (3%) in the elective group, 1 (100%) with free rupture, 2 (25%) with contained rupture and 3 (12%) in the urgent group. Major causes of death in 8 patients included 4 (50%) from ischemic heart disease, 2 (25%) from acute renal failure and 2 (25%) from respiratory failure due to chronic obstructive pulmonary disease (COPD).**

Conclusions: **The most significant comorbidity and cause of death of patients after AAA repair included ischemic heart diseases, renal failure and COPD.**

Keywords: **Abdominal aortic aneurysm; open abdominal aortic aneurysm repair**

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INTRODUCTION

Abdominal Aortic Aneurysms (AAAs) can be categorized according to the etiology: degenerative[1], inflammatory[2], post-dissection, traumatic, infectious and developmental anomalies. The majority of AAA occurs at the infrarenal level and remains asymptomatic until its size reaches 5.5 cm, at which time, according to the American College of Cardiology/American Heart Association (ACC/AHA) guidelines, the patient should undergo repair to eliminate the risk of rupture[3,4]. Emergency surgical repair of ruptured AAAs has an overall mortality of 90%, and urgent repair for symptomatic AAAs still has a mortality of at least 10%. However, elective surgical repair has less than 5% mortality, hence it should be offered to AAA patients before symptoms develop[5]. There have been many studies comparing open versus endovascular aneurysm repair (EVAR) of AAA in specialized medical centers, the prior assumption being that open repair produces superior durability, and EVAR requires more re-interventions. In the present study we review the results of open surgical repair of all AAAs (Lampang Regional Hospital does not currently offer EVAR) performed by one surgeon[6,7,8] during a 5-year period, describing the diagnosis, treatment, complications and mortality of AAAs, and compare this to results reported in the current literature.

PATIENTS AND METHODS

Patients with AAAs treated between August 2005 and August 2010 were identified in the hospital records, and operative notes, discharge summaries and out patients department (OPD) cards in follow up cases were reviewed. Patients were followed to determine the general condition, symptoms, physical examination and reevaluation with bedside duplex ultrasound examination one month after discharge from the hospital, then for the next three to six months for one year, and then annually. The study was conducted with approval of the Lampang Regional Hospital Research Ethics Committee. Data collected for each AAA patient included symptoms leading to the hospital, diagnosis, treatment, medical co-morbidity and complications. Elective surgical repair was defined as a planned repair in asymptomatic patients. Urgent repair was defined as a repair in symptomatic patients without rupture. Emergency repair was defined as a repair in ruptured AAAs, which included both free rupture into peritoneal cavity and retroperitoneal leakage. Hospital mortality was defined as death within one month after operation. All patients in the present study were operated on by one surgeon. Aortic repair was done via the transperitoneal approach (including minimal invasive aortic surgery for asthenic patients). Generally the operative steps were as follows: After entering abdominal cavity, the viscera were inspected for associated pathology. The small intestines were eviscerated to the right and placed within a sterile plastic bag to reduce fluid and prevent heat loss. The ligament of Treitz was exposed for further proximal aortic neck dissection and identification of the left renal vein to place the vertical aortic clamp against the vertebra just beneath the left renal vein. We do not encircle the proximal aortic neck with a vascular loop to avoid lumbar artery injury and disruption of lymphatic ducts. Both common iliac arteries were controlled in the same manner, to decrease the risk of inadvertent injury to both common iliac veins during circumferential dissection. Aneurysm sac was open using standard technique and vascular continuity was restored with inlay tubular or bifurcate Dacron graft. All anastomoses were done with 4/0 prolenevisiblack^{R}. Finally, we completely wrapped the repair with the native aortic wall, closed with 3/0 prolene, to protect the adjacent organs from the aortic graft.

The baseline data and outcomes were summarized as either mean and/or median and range, or counts and percentage. This was a descriptive study and no statistical hypothesis testing was performed.

RESULTS

Overall, 101 patients underwent AAA repair during August 2005 and August 2010 at Lampang Regional Hospital. Demographic data for these patients are presented in Table 1. Elective surgery was done in 66 patients (65%, with one non-surgical patient), 26 (26%) underwent urgent surgery, and 9 (9%) underwent emergency operation. The age and AAA size of all patients are shown in Table 2. All patients were examined with duplex ultrasound and/or CT angiography.

Table 3 shows that there were 85 (84%) patients with atherosclerotic AAAs. Six had bilateral common iliac aneurysm (CIA) in conjunction with AAA. Ten

Table 1 Demographic data for patients with AAA (August 2005 - August 2010), Lampang Regional Hospital

	Elective N = 66	Ruptured N = 9	Urgent N = 26
Gender: number (%)			
Male	37 (56)	4 (44)	9 (35)
Female	29 (44)	5 (56)	17 (65)
Risk factors: number (%)			
HT	22 (33)	4 (44)	3 (12)
IHD[a]	11 (17)	2 (22)	2 (8)
CRF[b]	5 (8)	1 (11)	1 (4)
PAD	1 (2)	0	0
Stroke[c]	1 (2)	0	0
COPD	3 (4)	1 (11)	1 (4)

[a]IHD = ischemic heart diseases: all documented and treated with aspirin, [b]CRF = chronic renal failure: Cr>2.0 mg%, [c]performance status = 1, HT = hypertension, PAD = peripheral arterial disease, COPD = chronic obstructive pulmonary disease

Table 2 Type of operation in relation to size and age in patients with AAA

	Type of Operation	Age (year) Median (range)	AAA size (cm.) Median (range)
Elective operation	Aortic graft	65 (50-81)	6.5 (4.8 - 8.2)
	Extra-anatomical bypass	75 (73-77)	5.4 (4.7 - 6.0)
Urgent operation	Aortic graft	80 (70-92)	5.5 (3.68 - 7.4)
	Extra-anatomical bypass	80 (77-82)	6.9 (6.5 - 7.4)
Emergency operation	Aortic graft	72 (64-81)	7.0 (6.0 - 8.0)
	Extra-anatomical bypass	77 (75-80)	8.1 (6.5 - 10.5)

AAA = Abdominal Aortic Aneurysm

Table 3 Demographic data for patients with atherosclerotic and non-atherosclerotic AAA, type of operation and operative mortality

	Aortic Graft	Extra-anatomical Bypass	Operative Mortality
Atherosclerotic			
Isolated infrarenal AAA	53	-	1
AAA with CIA aneurysm	16	-	1
AAA (Incidental finding)	4	-	-
AAA with TAA (< 5 cm.)	2	-	-
AAA with PAD	2	3	2
AEF (Aorto-enteric fistula)	5	-	-
Non atherosclerotic			
Mycotic AAA	1	3	1
Inflammatory AAA	6	-	-
Saccular AAA	5	-	1
Post pythiosisAAAa	-	-	1

[a]Two years after bilateral below knee amputation, AAA = Abdominal Aortic Aneurysm, TAA = Thoracic Aortic Aneurysm, PAD = peripheral arterial disease, CIA = common iliac artery, CFA = common femoral artery, SFA = superficial femoral artery

Table 4 Presenting symptoms or diagnosis which required urgent AAA repair

Distal embolization	
Toe gangrene	6
Limb gangrene	1
Aorto-enteric fistula	
Duodenum	4
Sigmoid colon	1
Thrombosed AAA with ALI	1
Pain (at site of AAA)	3
Mycotic AAA	
Salmonella	2
No growth	7
Inflammatory AAA	6

AAA = Abdominal Aortic Aneurysm; some patients have more than 1 symptom or diagnosis

had unilateral CIA, two had cholecystitis with AAA as an incidental finding, one also had gallstone with common bile duct stone, one had pancreatic cancer as well, two had a combination of descending thoracic aortic aneurysm (diameter < 5.0 cm) and AAA, and five patients had associated peripheral arterial diseases.

Table 3 also shows that aortic graft was used in 94 patients (93%) and extra-anatomical bypass in 6 (6%), while one patient with pythiosis did not undergo surgery to treat the aneurysm. There were 16 patients (16%) with nonatherosclerotic AAA, including 4 with mycotic AAA, 6 with inflammatory AAA, and 5 with saccular AAA. Two patients underwent reoperations for rebleeding due to anastomotic disruption, and one had acute right lower limb ischemia from suspected plaque disruption at the right CIA which required femoro-femoral bypass five hours after the AAA repair. In one patient, after the treatment for pythiosis of the peripheral vessels with bilateral below knee amputation for two years, a pulsatile abdominal mass with severe persistent abdominal pain developed. CT angiography demonstrated thick walled AAA 4.8 cm in size. Biopsy of the periaortic tissues revealed pythiosis of adjacent periaortic vessels.

Seven patients had severe co-morbid conditions, and were unfit for general anesthesia. All had difficult iliac runoff, which required extra anatomical bypass procedures, including four aorto-bifemoral bypass, one axillo-bifemoral bypass, and one aortoiliac with femoro-femoral bypass.

There were 8 hospital deaths: 2 (3%) after elective repair, 3 (33%) after emergency operations for ruptured AAA, and 3 (11%) after urgent surgery. Cardiac (4/8, 50%), renal (2/8, 25%) and pulmonary failures (2/8, 25%) were the leading causes of death. Operative death occurred in six of these patients.

DISCUSSION

Successful open AAA repair is based on a thorough understanding of anatomical details of the aneurysm of each patient, such as the proximal extension to the renal artery, concomitant common iliac artery aneurysm with or without hypogastric artery aneurysm, or other severely occluded diseased arterial braches. Visceral collateral circulation, such as those surrounding the inferior mesenteric artery, should be identified. Preoperative imaging with CT angiography can help define the many anatomical variations,which the duplex ultrasound cannot demonstrate. Careful preoperative assessment with history taking, physical examination, especially peripheral pulse (carotid bruit, DeBakey's test for estimated extension of the proximal aortic neck), chest radiographs, electrocardiography, and serum electrolytes measurements must be done to identify any major surgical risks.

From the demographic data presented, all patients in this study were elderly with associated comorbidities, such as ischemic heart disease, renal failure, cerebrovascular disease, peripheral arterial disease, and chronic lung disease. Hypertension and ischemic heart disease were the dominant comorbid diseases for all three treatment groups in the present study. Presenting symptoms of AAA which required urgent repair are shown in Table 4. Interestingly, there were six patients with inflammatory AAA. All six had only the inner lumen to use for anastomosis, bypass procedures, and to help achieve hemostasis. Nonetheless, the results of the repair were good, as demonstrated by follow up CT scan and the resolution of symptoms.

Three patients in the study needed a second operation. Two patients in the ruptured AAA group had intra-abdominal bleeding, which required reoperation, and one patient in the urgent repair group had acute limb ischemia and a further bypass procedure was done.

The overall mortality was 3% for elective group, 33% for ruptured group and 11% for the urgent

group. The most common postoperative complications and causes of death were cardiac, pulmonary and renal failure[9,10]. The author would like to stress the technique of not encircling the proximal aortic neck, and especially not encircling both common iliac run-offs, so as to avoid inadvertent injury to the lymphatic structures, retro-aortic lumbar artery and the common iliac vein. This requires the shortening of the aortic cross-cramp time, and entails minimal blood loss.

In the era of EVAR, studies have demonstrated that all-cause mortality was similar between EVAR and open repair, both in the mid-term and the long-term. In centers where EVAR is not available, open AAA repair remains the best treatment option. Acceptable peri-operative morbidity and mortality, especially for elective AAA repair[11], could be achieved, consistent with the current literature. The author encourages all general surgeons in provincial hospitals who have a special interest in vascular surgery to do AAA repair in selected cases, especially for patients less than 80 years of age and who have minimal co-morbidity[12]. Open AAA repair in experienced hands may yet produce superior durability and freedom from graft related re-intervention than EVAR.

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