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*Original Research Article*

# Surgical Outcomes of Ascending Aortic Aneurysm

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**Abstract**

This is a retrospective study which highlights the surgical outcome of 20 patients who were referred to the cardiac surgical department at Iben Al- Bittar Hospital from 2007 to 2015 as cases of ascended aortic aneurysm. The aims of this research is to focus on Diagnostic tools used in the referred patient and Treatment regimes, its outcome, and comparing it with results from other centers. The age of the patients ranged from 16-58, the commonest: age was 41-50, blood group was A +ve, male / female ratio was 4:1. 5% of patients were smokers, and another 5% were alcoholics, no history of trauma was detected. 90% of patients were diagnosed as annuloaortic ectasia, while the other 10% were diagnosed as mid, and distal ascending aortic aneurysm. 35% of patients were diagnosed as cases of Marfan syndrome, 10% were having renal cysts, and 10% were having gall stones as non-cardiac diseases. As cardiac associated diseases; 90% of patients were having sever aortic valve regurgitation, 5% bicuspid aortic valve, 5% mild-moderate aortic valve regurgitation. 90% of patients were having left ventricular dysfunction, 5% fair left ventricular function, and 5% good left ventricular function, and 15% were having mild-moderate mitral regurgitation. All of the patients were treated surgically, 75% of them were submitted to modified Bentall operation, 10% were treated with aneurysmoraphy and aortic valve replacement, 5% with aneurysmictomy, and direct end to end anastomosis with aortic valve replacement, 5% with aortic graft and coronary reimplantation, and the last 5% were treated with only aortic valve replacement. Coronary reimplantation was done for 75% of patients. 15% of patient died on table because of bleeding from anastomosing sites, and as non lethal complications; 10% were re-explored in the first post operative day. The life expectancy of patients with ascending aortic aneurysm undergoing surgical repair has improved and is consistent with increased survival.

**Key Words:** Bentall operation, Marfan syndrome, Thoracic aortic aneurysms.

# استعراض النتائج لجراحة أم الدم للشريان الأبهر الصاعد

**الخلاصة**

دراسة استعادية اجريت في مستشفى ابن البيطار لجراحة القلب في بغداد تسلط الضوء على النتائج الجراحية ل 20 مريض مصابين بأم الدم للشريان الابهر الصاعد تمت احالتهم من اقسام الباطنية لتلقي العلاج الازم وللفترة من 01 \ 01 \ 2007 ولغاية 01 \ 12 \ 2015.

تم أجراء التداخل الجراحي لكل المرضى وعلى الشكل الاتي : تم أجرء عملية بنتال لدى 75 % و تم أجراء عملية اصلاح الشريان الأبهر مع تبديل الصمام الأبهر لدى 10% وتم اجراء عملية استئصال أم الدم مع مفاغرة النهايتين وتبديل الصمام الأبهر لدى 5% وتم أجراء عملية استبدال الشريان الأبهر بأخر صناعي مع اعادة زراعة الشرايين التاجية لدى 5% وأخيرا تم أجراء عملية تبديل الصمام الأبهر ل 5%. توفى 15% من المرضى أثناء أجراء العملية من جراء النزف من مكان المفاغرة, وتم أجراء عملية استكشاف ثانوية بسبب انحصار القلب أثر انصباب دموي لغشاء التامور , وارتفعت نسبة اليوريا في الدم ل 5%, وأنصباب غشاء التامور بعد 9 ايام لدى 5%. في هذا الاستعراض نلقي نظرة على طرق التشخيص والعلاج انتهاءا" بالنتائج والعقابيل المحتملة بالاضافة الى اخر المستجدات في العلاج والعوائق التي تقف بوجه اجراء مثل هذه الاستجراحات في بلدنا.

واخيرا وعلى الرغم من اهمية هذا المرض, والتطورات والنتائج الباهرة الحاصلة عالميا على صعيد التشخيص والعلاج والمتابعة, الا ان بلدنا وللاسف مازال يعاني قصورا في هذا المجال وذلك نظرا لتعثر الامكانيات وقلة الدعم الازم لأجراء مثل هذا النوع من الجراحة.

**الكلمات المفتاحية:** عملية بنتال، ,متلازمة مارفان, ام الدم للشريان الابهر الصاعد .

## Introduction

In 1956, Cooley and DeBakey delineated a method supracoronary graft replacement of the aorta with an artificial graft. In 1960, Mueller et al combined supracoronary graft with bicuspidization of associate incompetent semilunar valve. In 1963, drummer et al delineated supra-coronary graft replacement and replacement of the semilunar valve. In 1968, Bentall and American state Bono delineated a method for substitution the aorta and semilunar valve with a composite graft [1].

**1.2 Emberiology:** At about the 6 mm stage a pair of opposing ridges appears in the cephalic part of the truncus. They rapidly enlarge, touch each other, after complete fusion the ridges form a septum known as the aortopulmonary septum. At its proximal end this septum meets and fuses with the distal bulbar septum while its distal end the aortopulmonary septum meets the dorsal wall of the aortic sac , part of the caudal end of the sac is incorporated in the pulmonary trunk [2]. The cephalic end of the sac becomes drawn out into right and left limbs as the neck lengthens. The right limb becomes the brachiocephalic trunk and the left limb forms that part of the arch of the aorta . The reminder of the sac contributes to the formation of the arch of the aorta [3].

**1.3 Relevant anatomy:** The aorta is the main artery that delivers oxygenated blood from the heart to the tissues of the body. It is divided surgically into the following parts: - Proximal aorta (ascending aorta, and arch of Aneurysms are localized abnormal, persistent dilatation of a vessel, usually an artery. The dilatation, resulting from a weakness of the vessel wall, may be saccular, fusiform, or cylindrical. In the typical aneurysm, all layers of the vessel wall are included. A dissecting aneurysm is not a typical aneurysm, in that there is not a dilatation including all layers of the vascular wall, but there is some distention of the outer portion of the wall [9].

**Cystic medial degeneration:** Aneurysms of the aorta), and Distal aorta (descending thoracic aorta, and abdominal aorta) [3,4].

The aorta is consist of three layers: the intima, media, and adventitia. The intima is important because the etiologic factor of many thoracic aneurysms is atherosclerosis. The media is important because of the degenerative nature of cystic medial necrosis and its involvement in patients as well as in dissecting aneurysms; it contains approximately 45-55 lamellae of elastin, collagen, smooth muscle cells, and ground substance[5]. Elastine content is highest within the ascending aorta, as would be expected with its complaint nature, and decrease distally in the descending and abdominal aorta [6]. The adventetia is important because it is a strong supportive tissue that may protect patients from sudden death secondary to rupture into the mediastinal cavity or free space of pleura, which may be seen in dissecting and / or traumatic transected aorta after high-speed automobile accident [7].

**1.5 Etiology and Pathogenesis:** Thoracic aneurysms could contain one or a lot of aortic segments (aortic root, aortic, arch, or descendent aorta) and area unit tagged consequently (figure-1). Sixty proportion of pectoral aortal aneurysms contain the aortal root and/or ascended aorta, 40 proportion contain the descended aorta, 10 proportion contain the arch, and 10 proportion contain the thoraco-abdominal part of aorta (with some involving >1 segment) [8].

the ascended aorta most commonly effect from medial cystic degeneration, These aneurysms are often associated with marked enlargement of the sinuses of Valsava and aortic root and it has been termed as annuloaortic ectasia [10].

**Marfan Syndrome:** The prevalence of medial cyctic degeneration in younger sufferers is already go with Marfan syndrome (or and different low-original connective-tissue problems, corresponding to Ehlers-Danlos syndrome) [11].

**Familial Thoracic Aortic Aneurysm Syndrome:** It obvious in sufferers with aneurysms of ascended aorta who do not have clear connective-tissue diseases. Furthermore, it is at present famous that even though cases of aneurysms of pectoral aorta with no connective-tissue problems is also sporadic, they are customarily familial [12].

**Bicuspid Aortic Valve:-** A lot of cases of aneurysms of ascended aorta are associated with the presence bicuspid aortic valve. It was as soon as concept that such aneurysms had been because of" poststenotic dilatation" of the ascended aorta [13]. It was found that suffers with normally functioning bicuspid aortic valves might develop Aortic dilatation on the degree of the tubular element of the ascended aorta or at the level of the sinuses (i.e., basis) [14]. In fact, other reports have confirmed that a abnormal bicuspid aortic valve is related to a large size aorta [15].

**Atherosclerosis [16]**

**Mycotic aortitis:-** it is less common cause of aortic aneurysm that result from a primary infection of the wall of aorta lead to dilated aorta with the formation of often saccular or fusiform aneurysm [17].

**Syphilis [18].**

**Turner's Syndrome:** It is related to presence of cardiovascular malformations, together with a bicuspid aortic valve and coarctation of the aorta. aneurysms of thoracic aorta are additionally discovered [19].

**Aortic Arteritis:** It is a chronic inflammatory problem with no evident etiology. It affects women more often than men, and the mean age is 29 years [21].

**Aortic Dissection[22], Trauma[23]**

**Clinical manifestation and natural history:** Most sufferers are free of symptoms at diagnosis, considering the aneurysms of aorta are usually found out accidentally on imaging stories (chest x-ray, CT scan, or echocardiogram) asked for other motives [24]. Aortic aneurysms of the basis or ascended part may just produce secondary aortic valve insufficiency or, less more often than not, sufferers may just reward with heart failure. When aneurysms are gigantic, sufferers could suffer a neighborhood mass outcome, akin to pressure effect of the trachea or most important stem bronchus (inflicting cough, dyspnea, wheezing, or recurrent pneumonitis), pressure effect of the esophagus (inflicting dysphagia), or pressure effect of the recurrent laryngeal nerve (inflicting hoarseness),and distal embolization may just arise. Not often, chest or again agony could occur with non-dissecting aneurysms for this reason of direct pressure effect of different intra thoracic organs or eroding into adjoining bone [25].

The scary final result of ascending aortic aneurysms is aortic tear or rupture, which is possibly fatal. Usual symptoms of acute syndrome of aorta include sudden onset of severe ache in the chest, neck, again, and/or stomach. The explanation of ascending aortal aneurysms has not been well outlined. One reason for this is often that each the etiology and

site of associate aneurism could have an effect on its rate of growth and propensity for dissection or rupture. A second reason is that it's rare, within the era of recent imaging and aneurism size, to really enable better-known aneurysms to grow till they rupture, as a result of surgery is typically performed once aneurysms area unit simply giant enough to be thought of vital risk for rupture [26].

**Diagnosis and Sizing:** Frequently, aneurysms of thoracic aotra are evident on the x-ray chest films via widening of the mediastinal shadow , growth of the knob of aorta, or deviation of trachae. Nevertheless, aneurysms of small size and even some huge others won't produce any findings on films of chest x-ray.Hence, if x-ray film suggests an dilated aortic shadow , one must have to send the patient for other tomographic imaging (e.G., CT scan) to define the aortic anatomy [27].

The aortography will also document the degree of cephalic displacement of the coronary ostia and the severity of the aortic valvular regurgitation. Coronary angiography is usually performed preoperatively in sufferers with aneurysms of the ascended aorta who are over the age of forty years or who have a history of ischemic heart disease. An alternative is MR angiography, which images the thoracic aorta in multiple planes and therefore readily permits on-axis measurements. Transthoracic echocardiography is effective for imaging the aortic root and Transesophageal echocardiography can visualize the entire thoracic aorta good on [28].

The scientific cures available to slow the event of ascending aortal aneurysms and deflate their likelihood of dissection or rupture area unit rather restricted. during a randomized be educated of adults with Marfan syndrome, Shores et al determined that medication with propranolol (versus no ß-blocker remedy) over ten years resulted during a greatly slower rate of aortal dilatation, fewer aortal routine, and reduce mortality. unfortunately, whether or not or not these benefits will real be calculate to the non-Marfan people with pectoral aneurysms stays unknown. However, it's mechanistically logical that clinical healing to manage pressure of blood would be helpful for the remedy of patients with aneurysms of aorta. As presently as ß-blocker medical care is maximized (or within the occasion that ß-blockers area unit contraindicated or now not tolerated), any persistent high blood pressure can ought to be handled with completely different anti-hypertensive drug dealers to hold the blood stress all the method scale back to a little-typical selection, eg, pressure of heartbeat of 1 zero 5 to 100 and twenty millimeter of mercury [29]

**Surgical Treatment:-** The best time of doing surgery of aneurysms of ascended aorta stays quite unsure. For most aneurysms of ascended aorta, surgical procedure is done when reach size of 5.5 cm. Amongst these with high surgical danger (ex; old aged or those with unfit cardiopulmonary reserve), the threshold can be raised to 6 cm or extra earlier than recommending surgical procedure. Conversely, amongst suffers who're at high risk of aortic tear or rupture (ex, Marfan syndrome or bicuspid aortic valve), it's encouraged to be repaired when the ascending aortic aneurysms attain simplest five cm and in chosen instances (those at above all more chance), at even diameter of smaller size. Moreover, when sufferers with a abnormal bicuspid valve require valve substitute surgical procedure, prophylactic substitute of the ascended aorta is advocated if its size is 4 cm or more because such patients would stay at more hazard for subsequent aortic tear and dissection. The death rate of optional surgical repair of aneurysms of ascended aorta in large centers is 3% to 5% [30].

Some younger sufferers have an expanded aortal root, however due to intrinsic valve pathology, the semilunar valve cannot be spared. For these wish to avoid the prosthetic valve needed with the composite aortal graft, one different has been a pulmonic autoplasty, usually remarked Ross method. Thought about one among its main barriers is that the progress lately autoplasty root dilation, that is mainly problematical amongst people who had aortal root dilation prooperativly [31].

When full aortal root/valve substitute is crucial, another different to a composite graft is that the usage of cryopreserved aortal allografts (cadaveric aortal root and proximal ascending aorta). however, when the approach, late structural valve deterioration will arise and will lead to consequent reoperation [32].

## Materials and Methods

This is a retrospective study of 20 patients referred by the cardiologists to the cardiac surgical department at Iben Al- Bittar Hospital from 2007 to 2015 as cases of ascending thoracic aortic aneurysm; they were evaluated and treated by cardiologists for a variable time then referred to have surgery in the cardiac surgical department.

Those patients were admitted in the surgical department; data were collected directly from the patients or from their relatives as well as additional information's were obtained from their referral sheets regarding the details of preoperative investigations. The diagnosis was made by re assessment of the primary referral diagnosis with; physical examination, routine radiological, laboratory investigations including blood, and biochemical tests, and transthoracic echocardiography, unavailability of CT, and MRI study precluded its proper diagnostic tool for the nature of the disease, and the associated relevant cardiac diseases. The patients were operated upon and referred for the ICU department where they stayed for two days under close surveillance for many variables, and the pulmonary function was maintained by the use of an endotrachial tube and respirator until the patients' cardiac and respiratory status were stable, the normal values for the arterial $Po_2$, $Pco_2$, and ph were maintained relatively, and maintenance of an adequate cardiac output was also of crucial importance to maintain. After that the patients were transferred to the ward and stayed for another five days then they were discharged home and were followed up weekly but unfortunately the follow up details for those patients was not documented in the tables.

**Results:**

Age distribution of the patients ranged from 16-58 years as illustrated in (Figure 1).

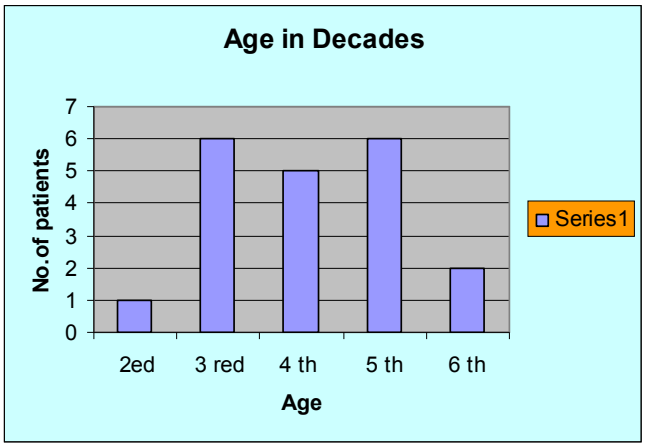


**Figure 1:** A diagram representing age distribution of ascended aortic aneurysm in decades showing the maximum magnitude at the third and fifth decades

Sex distribution revealed males to be more common than female by a ratio of 4 to 1 (Figure 2).

Blood group of 50% of the involved patient were A+ve, 25% of O+ve, 20% of B+ve, and 5% were B-ve (Figure 3). 5% of patients were smoker, and another 5% were alcoholics, and no history of trauma was recorded in all patients. 25% of patients were from Baghdad, 25% were from Taamim and 15% were from North of Iraq, all of the females were house wives, and 55% of males were business men, and 10% farmers. 25% of patients were having history of hypertension and were on regular treatment. 90% of the patients were having sever aortic valve regurgitation, 5% were having mild-moderate aortic valve regurgitation, and 5% were having bicuspid aortic valve (Figure 4).

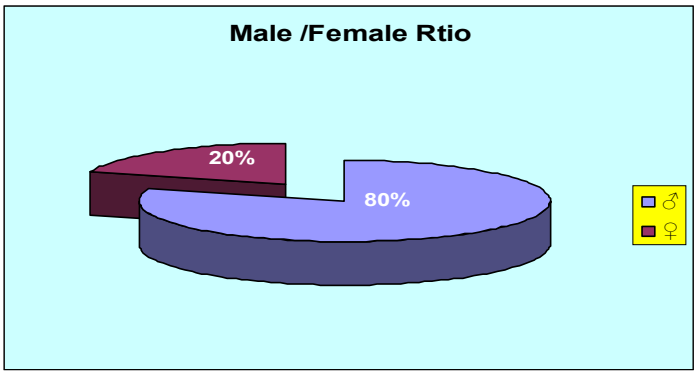


**Figure 2:** A diagram demonstrating sex distribution of ascending aortic aneurysm showing male rate of 80% in comparison with females 20%.

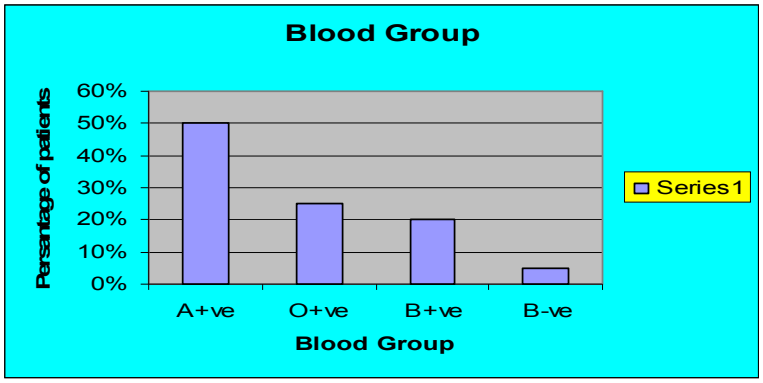


**Figure 3:** A diagram demonstrating blood group distribution of patients with ascending aortic aneurysm patient showing the maximum percentage in A+ve group.

90% of patients were having left ventricular dysfunction, 5% were having fair left ventricular function, and 5% were having good left ventricular function (Figure 5), and 15% were suffering from mild-moderate mitral regurgitation.

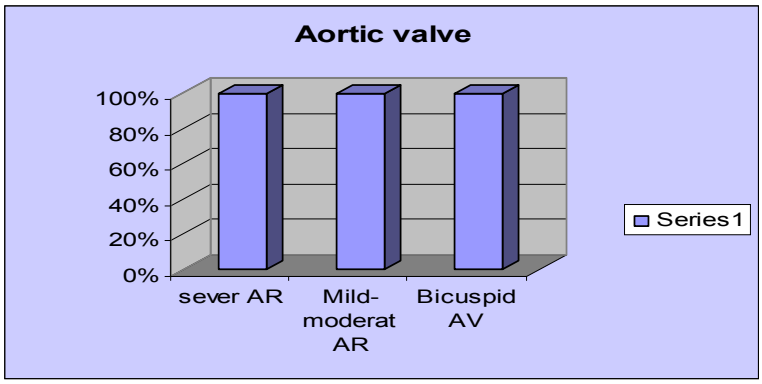


**Figure 4:** A diagram demonstrating aortic valve condition preoperatively showing high rate (90%) of sever aortic regurgitation.

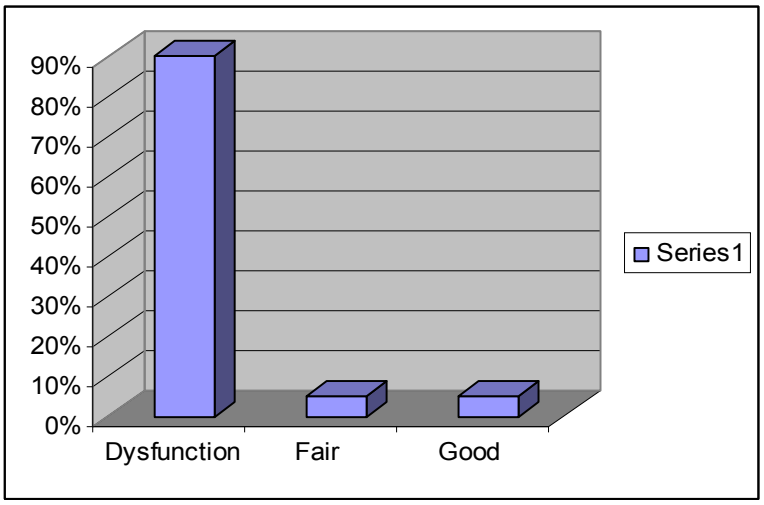


**Figure 5:** A diagram demonstrating preoperative left ventricular function.

30% of patients were diagnosed as Marfan syndrum, 10% were having renal cyst, 10% were having gall stones, and 10% were having chronic chest infection as non cardiac associated diseases as demonstrated in (Figure 6). 85% of suffers were diagnosed as annuloaortic ectasia, and 15% were diagnosed as fusiform ascending aortic aneurysm of mid and distal ascending aorta, and no associated extra aortic aneurysm, nor associated coronary artery diseases was recorded.

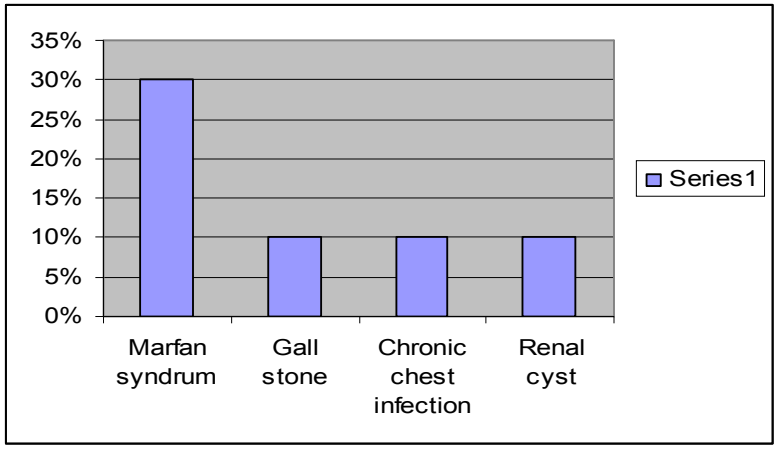


**Figure 6:** A diagram demonstrating preoperative non cardiac associated diseases.

The commonest presenting symptom was shortness of breath in 50%, other symptoms in order of frequency was retrosternal pain 25%, palpitation 5%, easy fatigability5%, epigatric pain, lump in the med, and right side of the chest, and lastly syncopal attaches in 5% (Figure 7).

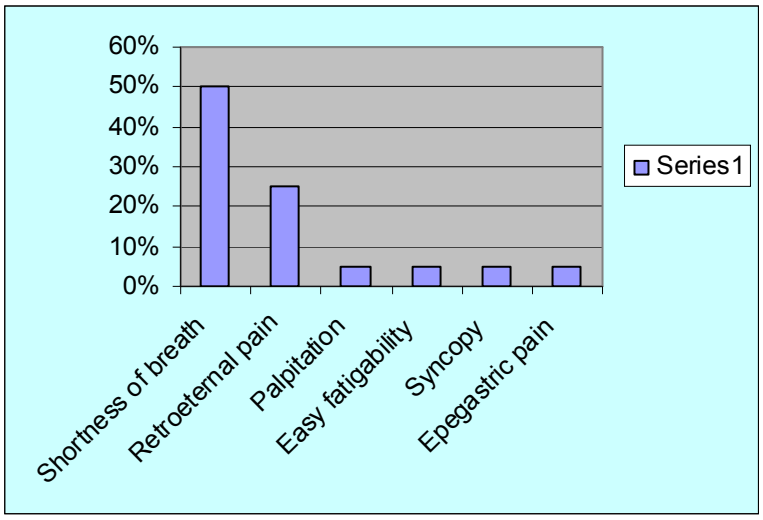


**Figure 7:** A diagram demonstrating the presenting symptom

All of the 20 referred patients have been subjected to surgical intervention for repairing their ascending aortic aneurysm, the type of CPB was in 70% partial, partial with right femoral cannulation in 25%, partial with aortic arch cannulation in 5% . Bentall operation was performed for75%, aneurysmorraphy with AVR for10%, aneurysmictomy and direct anastomosis end to end with AVR for 5%, aortic graft with coronary arteries reimplantation for 5%, and simple AVR for 5%.

This study has demonstrated an acceptable overall patient outcomes after surgery with an average 86% survival with a mortality rate of 15%. The long-term survival after the procedure had not been determined because of the deficient records. Early nonfatal events included; 10% were re-explored in the first post operative day because of cardiac tamponade and signs of low cardiac output syndrome, and found to have bleeding from the anastomosing sites, 5% developed uremia and low cardiac output syndrome, and 5% developed pericardial effusion after 9 days (Figure 8).

The mean 5-year survival rate for patients operated upon was not determined also because of the deficient records.

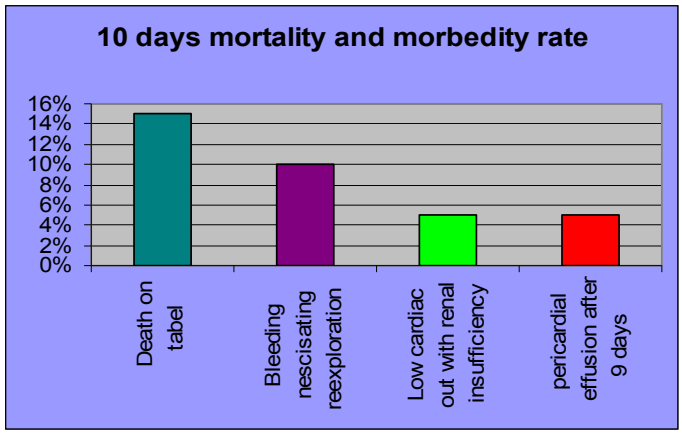


**Figure 8:** A diagram representing postoperative 10 days mortality and Morbidity rate.

**Discussion**

The aims of this research is to focus on :- Diagnostic tools used in the referred patient to Ibn-Albitar Hospital for planning the proper treatment, Treatment regimes, its outcome, and comparing it with results from other centers and Limitations and the way to overcome them.

The male/female incidence of ascending aortic aneurysm of this dissertation was parallel to that recorded in studies conducted by Donaldson and Roses from 1982, Culliford et al from 1982 and Cabrol et al from 1988 and as hypertension, smoking, and alcoholism were well recognized risk factors in the above studies, the incidence of hypertension in this study was 25%, smoking, and alcoholism were 5% for each [6].

The investigations which need to be pointed, and focused on are:

Transesophagial echocardiography was used in only 30% of the patients even though it's images can show the Aortic valve, ascended aorta, and descended thoracic aorta, and it is more sensitive and specific than transthoracic echocardiography, and it may well support adequately differentiate aneurysm and dissection, however the snap shots have to be received and interpreted by skilled personnel, so it seems that it is underused in our patients.

Aortography, was used in all of the patients in spite of its disadvantages which include renal toxicity, shower of emboli and use of radiation.

Computed tomography scan (CT) was utilized in handiest 15% of the patients even though the CT scans with contrast have turn out to be essentially the most greatly used diagnostic software world broad. They quickly and exactly check the area and extent of the condition and the relationship to predominant department vessels and surrounding buildings.

Magnetic resonance imaging (MRI) wasn't used altogether the patients knowing that tomography and resonance X-ray photography have the capabilities of avoiding toxic distinction and radiation compared with CT scans, and will to boot aid safely reveal the region, extent, and size of the aneurism and its relationship to branch vessels and closeorgans. These reports in addition precisely give away aortal composition. all the same, they are additional time overwhelming, abundant less quite merely to be had, and additional steeply-priced than CT scans [31].

Ascending aneurysm repair has been well headquartered and is performed safely with low morbidity and mortality. The controversies consist the utilization of valve-sparing root replacements in patients with ascending aneurysm mainly in circumstances of Marfan syndrome with regard to the duration of the restore. however, in sight that the majority patients with ascending aneurysm bear the operation at a similar time they're young, they potential need reoperation finally and therefore the more years of economical their native semilunar valve and without anticlot medical aid area unit valuable thus a valve-sparing root replacement and Ross operation had to be thought-about on those occasions .All of the patients were treated surgically, early nonfatal events included bleeding requiring surgical re-exploration was in comparison with studies conducted by Donaldson and Roses from 1982, Culliford et al from 1982 and Cabrol et al from 1988 (10%:11.1%), myocardial infarction (0%: 6.9%), acute renal insufficiency (5%: 6.9%), pulmonary insufficiency (0%: 6.9%), low- output syndrome (5%: 5.5%), and stroke (0%;4.1%) [32]. Bleeding could be a capabilities complication for all aneurism repairs, and it had been recorded because the principal reason of dying on table on 15 August 1945, and a non deadly complication that demanded re-exploration. it's reduced by means that of meticulous procedure, victimisation felt strips, anti-fibrinolytics, and causes, together with modern frozen plasma and platelets. For sufferers WHO endure low temperature circulatory arrest, the employment of aprotinin is controversial, however most teams

generally use aminocaproic acid (Amicar). Coagulopathy and hemorrhage in extreme cases might warrant the usage of facet VII. Stroke air embolism, arrhythmias, atelectasis, pneumonia, Paraparesis and paraplegia, either acute or delayed, and myocardial infarction were causes of comorbidity and in the above studies and most often results from showering emboli from atherosclerotic debris or clot in reports, nevertheless it had not complicated any of our sufferers. Talents issues detailed to the Bentall method including; graft illness, or coronary insufficiency was not recorded in sufferers integrated on this be taught. The mortality price recorded on this summary seems to be slightly greater than reports conducted by Donaldson, and Roses from 1982 , Culliford et al from 1982 and Cabrol et al from 1988 that revealed a death rate of 4-10%, and a rate of 3-5% in large centers. The mean 5-year survival rate for patients operated on was not determined because of the deficient records as we mentioned, while it was 91.5 ± 2% in the above studies. The same for the long period clinical follow-up, as there was no records about endocarditis, anticoagulant-related hemorrhage, valve thrombosis, and prosthesis failure [6,32].

## Conclusions

Whereas aortal aneurysms area unit less common that several different vessel conditions, the actual fact that they'll be life threatening which even giant aneurysms mig ht not manufacture symptoms makes it all the additional necessary for clinicians to be wakeful in their analysis of patients in danger. as a result of aneurysms area unit typically 1st detected on an imaging study ordered for different indications, ANy suggestion of AN enlarged aortal vessel ought to promptly followed with an applicable dedicated imaging study particularly CT and MRI. A broadening medical recognition of aortal aneurysms and the way of prognosis will aid lessen the comorbidity and death rate associated with this situation. The life expectancy of patients with ascending aortic aneurysm undergoing surgical repair has improved and is consistent with increased survival. Bentall operation still represents the procedure of choice for ascending aortic aneurysm. Patients undergoing elective surgery have demonstrated high outcomes than patients who underwent the operation on an emergency basis and younger patients have good outcomes after surgery than do older adult patients."

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