REINTERVENTIONS AFTER CONVENTIONAL SURGICAL REPAIR OF ABDOMINAL AORTIC ANEURYSMS - A RETROSPECTIVE ANALYSIS

THESIS

Submitted for the partial fulfillment for the requirement of the degree of

MCh in Vascular Surgery

By

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SREE CHITRA TIRUNAL INSTITUTE FOR MEDICAL

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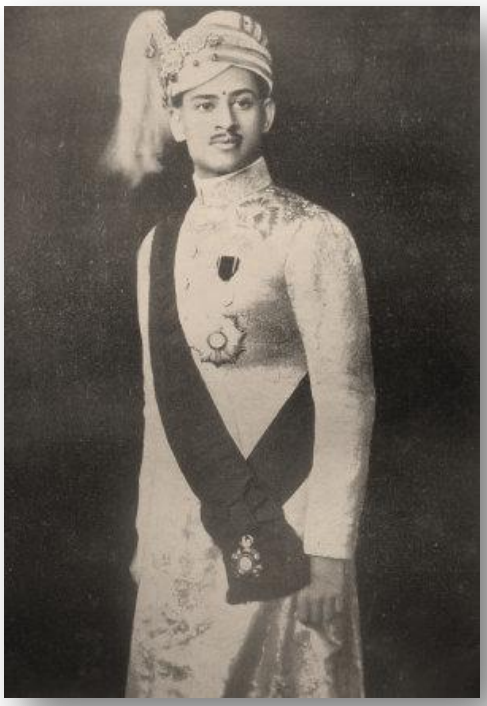

Travancore, an erstwhile province of pre-independent India, was ruled by Maharaja Sree Chitra Tirunal Balarama Varma until the country became independent in 1947. The Government of India took over the province after independence and was incorporated into the state of Kerala.

Known for their munificence, the royal family of Travancore considered themselves 'dasas' (servants) of Lord Padmanabha, the reigning deity of Travancore. Interestingly, they wore turban instead of a crown as a mark of respect to the Lord. Their philanthropy finds expression in their countless contributions to the country, then and now.

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PRAKASH ……

Thiruvananthapuram *Date*

DECLARATION

I, **PRAKASH GOURA**, hereby declare that the project in this book was undertaken by me under the supervision of Dr. R C Sreekumar, Head of Division of Vascular Surgery, Dept of CVTS, Sree Chitra Tirunal Institute for Medical Sciences and Technology, Thiruvananthapuram.

Date: **PRAKASH**

Forwarded Resident, Vascular Surgery

The candidate, **PRAKASH**, had carried out the minimum required work in this project

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CERTIFICATE

*Certified to be the bonafide record of **Dr Prakash**, the work done at Vascular Surgery division, Department of CVTS, as part of MCh Programme in Vascular Surgery at Sree Chitra Tirunal Institute for Medical Sciences and Technology, Thiruvananthapuram, for a period of three years from January 1st, 2015 to December 31st, 2017.*

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TITLE

REINTERVENTIONS AFTER CONVENTIONAL SURGICAL REPAIR OF ABDOMINAL AORTIC ANEURYSMS - A RETROSPECTIVE ANALYSIS

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INTRODUCTION

Open Abdominal Aortic Aneurysm (AAA) repair is a procedure rich in history and with years of robust, long-term outcome data. Initially described in 1952 by Dubost et al, open repair has undergone continuous evolution and refinement[1]. Current outcomes with elective open repair are excellent, with perioperative mortality rates between 1% and 7% depending on center volume and surgeons' experience[2] [3] [4]. Notably, a recent meta-analysis of the randomized trials of endovascular aneurysm repair (EVAR) demonstrated a 3.3% 30-day mortality among the combined 1342 patients repaired via the open technique[5]. This is concordant with a 4% mortality reported for the highest volume centers in an administrative database study using the National Inpatient Sample (NIS), although single-institution case series and carefully controlled registry studies have reported even better results.

Since its introduction in the early 1990s, EVAR has dramatically transformed the management of AAA. Every generation of EVAR devices has become more advanced and the indications for use (IFU) have steadily expanded to incorporate more complex anatomy[6] [7] [8].Epidemiologic studies using administrative databases attest to this, with significant reductions in the number of open aneurysm repairs

performed over time in both the Medicare database[9] and the NIS[10]; as of 2006, 60% to 70% of all AAA repairs in these populations were being performed by EVAR. Additionally, high-quality randomized controlled studies have demonstrated better short- and medium-term outcomes. But the long term outcomes of EVAR are still an area of concern and debate, with few randomised controlled trials showing at least equivalent outcomes, with EVAR, as compared with open repair[11 12 13 14].The better short term results have propelled EVAR to become the primary mode of therapy for the majority of patients with AAA, with open repair reserved for those with increasingly complex anatomy or coexisting disease process that prohibit them from an endovascular repair[15 16 17]. Nonetheless, open AAA repair remains a mainstay of vascular surgery. In our retrospective study we have analyzed early and long term outcomes and incidence of complications and re-interventions after conventional open repair of abdominal aortic aneurysms. We also have made an effort to compare out results with the current available literature for long term outcomes and re-interventions for EVAR.

AIMS OF THE STUDY

1. To assess the long term survival in patients undergoing open repair of elective abdominal aortic aneurysms.

2. To assess re-interventions on long term follow up.

3. To assess the perioperative mortality and morbidity in patients undergoing elective abdominal aortic aneurysm repair.

REVIEW OF LITERATURE

HISTORY OF AORTIC ANEURYSM SURGERY:

In the past 50 years, we have witnessed the most spectacular period of growth and development in the long and fascinating history of vascular surgery. As in all things, the basis for today's modern vascular surgery rests on achievements from the past. As Thomas Carlyle wrote, "History is the essence of innumerable biographies."

Studies of Egyptian mummies have revealed that atherosclerosis and arterial calcification were relatively common 3500 years ago[18].The Ebers Papyrus is among the earliest medical writings and is thought to have been prepared around 2000 BC. The writer clearly identified arterial aneurysms, probably peripheral aneurysms, and recommended the following treatment: "Treat it with a knife and burn it with a fire so that it bleeds not too much."[19]

Antyllus, a Greek surgeon of the 2nd century AD, has left the earliest record of attempted therapy of aneurysms. Although his writings have been destroyed, his

ideas are recorded in the works of Oribasius, who lived in the 4th century AD. According to Oribasius, Antyllus said, "We decline exceptionally big aneurysms, but we will operate as follows on aneurysms in the extremities, the limbs and the head." Antyllus applied ligatures to the arteries that entered and left the aneurysm and then cut into the aneurysm sac, evacuated the contents, and packed the cavity. Antyllus did not resect the aneurysm sac. He stated, "Those who tie the artery, as I advise, at each extremity, but amputate the intervening dilated part, perform a dangerous operation. The violent tension of the arterial pneuma often displaces the ligatures."[20] This good advice was given 1800 years ago. Ambroise Paré (1510-1590) advocated the application of a proximal ligature to aneurysms but did not believe the sac should be opened because of the danger of severe and fatal hemorrhage. Paré also described a ruptured aneurysm of the thoracic aorta and wrote, "The aneurysms which happen in the internal parts are incurable." Andreas Vesalius (1514-1564) was a friend and colleague of Paré and apparently was the first to describe thoracic and abdominal aortic aneurysms.[21]

With John Hunter (1728-1793), surgery began to emerge as a scientific discipline on the basis of anatomy and physiology On December 12, 1785, he ligated the superficial femoral artery high in the thigh in the area now known as Hunter's canal to treat a popliteal aneurysm. The patient did well; the aneurysm shrunk to a hard knot, and the limb survived.[22]

Rudolph Matas[23] [24] (1860-1957), of New Orleans, was a pioneer in the field of vascular surgery. He made many contributions to all areas of surgery, but he is best remembered in vascular surgery for his operation of endoaneurysmorrhaphy. He first performed this operation May 6, 1888, on a patient with a large traumatic brachial artery aneurysm of the left arm. After ligation of the proximal and distal arteries, an incision was made into the aneurysm, and the clot was removed. The orifices of the blood vessels that entered the sac then were sutured from within, which preserved the collateral blood supply to the extremity.

This operation markedly reduced the incidence of gangrene and amputation that followed the procedure in a high percentage of patients who underwent the Hunterian ligation for popliteal aneurysm. This principle is still used.

On October 19, 1944, Crafoord and Nylin[25] in Sweden reported the first successful end-to-end anastomosis of the aorta after resection of an aortic coarctation. On March 2, 1951, Schafer and Hardin[26] resected an abdominal aortic aneurysm with a bypass shunt and replaced the aorta with a human homograft. The patient survived the operation but died 29 days later of hemorrhage from a leak in the native aortic wall. The first successful resection of abdominal aortic aneurysm with graft replacement was performed on March 29, 1951, by Charles Dubost in Paris. He used an extraperitoneal thoracoabdominal approach with resection of the 11th rib. The graft used was the thoracic aorta taken 3 weeks previously from a 20-year-old

woman. The patient's left common iliac artery then was anastomosed to the side of the graft[27].

After Dubost's report, the abdominal aortic aneurysm sac would be completely removed before the graft was placed, but this technique was sometimes difficult and hazardous. Therefore, in 1966, Oscar Creech[28],of Houston, combined the endoaneurysmorrhaphy technique of Matas with graft replacement that left the aneurysmal sac in place. This single step has greatly simplified aneurysm surgery.

In 1954, DeBakey and his group began working on various materials for grafts. DeBakey collaborated with Professor Thomas Edman, a Philadelphia textile engineer, to build a new knitting machine to make seamless Dacron grafts of all sizes, shapes, and configurations[29].Various refinements were made in these grafts, which culminated in the standard grafts in use at the present time.

Aortic surgery thus has had a fascinating history. From Cooper to Matas, 106 years were needed to obtain a successful outcome of aortic ligation for abdominal aortic aneurysms. However, more progress has been made in the last 50 years than in the preceding 2000 years since Antyllus ligated, incised, and packed his cases of aneurysms.

TERMINOLOGY

Abdominal aortic aneurysms occur in all segments of the abdominal aorta and frequently extend into one or both common iliac arteries. The vast majority of these affect only the infrarenal aorta, allowing for proximal vascular control as well as a proximal graft anastomosis below the renal arteries. More proximal aneurysms that abut the renal arteries are considered pararenal aneurysms and can further be broken down into juxtarenal aneurysms (in which the aorta is aneurysmal just up to, but not including, the renal artery orifices) and suprarenal aneurysms (in which the aneurysmal aortic segment includes the origins of the renal arteries as well)[30].19

Repair of juxtarenal aneurysms requires the placement of a proximal aortic cross-clamp above the level of the renal arteries, but the proximal anastomosis occurs below the renal arteries and the renal arteries themselves do not require revascularization.

INDICATIONS

Based on data from randomized trials, AAA has traditionally been recommended when the maximal cross-sectional diameter reaches 5.0 to 5.5 cm[31 32].This is due to the relative risk of mortality associated with repair comparing favorably to aneurysm rupture. In addition, rapid aneurysm growth or the presence of a symptomatic aneurysm mandates repair. Unsuitability for EVAR and complications or a failed (graft migration or recalcitrant endoleak) EVAR are the recent indications in centers where EVAR is the predominant modality of treatment in these patients. The presence of a horseshoe kidney with multiple renal and isthmus arteries originating from the aorta and iliac arteries[33] is best served with open repair so that these vessels will not be excluded[34]. Likewise, patients in which the patency of the inferior mesenteric artery (IMA) needs to be maintained, such as those with bilateral hypogastric artery occlusion, SMA stenosis/occlusion, or previous colectomy, may require open aneurysm repair as well.

PREOPERATIVE ASSESSMENT AND PLANNING

Open abdominal aortic aneurysm repair is a substantial undertaking for the patient. Careful patient selection and preparation is critical to obtaining excellent outcomes. Because of the physiologic derangements that occur as a result of the hemodynamic stress of an aortic cross-clamp, a detailed understanding of the patient's cardiac, pulmonary, and renal function is necessary to determine who is a candidate for open repair. Routine measurement of serum chemistries, hematologic profile, and coagulation studies is essential, as well as electrocardiogram and chest x-ray. Additionally, carotid duplex studies, transthoracic echocardiography, and pharmacologic cardiac stress testing with nuclear imaging add valuable data to help evaluate a patient's suitability for open aneurysm repair. In patients with a history of significant recent weight loss, nutritional parameters may be predictive of perioperative complications. Similarly, in patients with a history of liver disease and cirrhosis, appropriately tailored preoperative studies should be considered.

Besides patient factors, a keen understanding of an individual's specific anatomy is necessary to adequately plan the operation and appropriately counsel the patient about the anticipated risks and benefits of the procedure. The anatomy will influence the level of the aortic cross-clamp and the complexity of the repair. Thus detailed radiographic imaging, usually in the form of contrast-enhanced computer

tomography (CT) is important. These studies are necessary to understand the extent of aneurysmal, as well as occlusive, disease and to reveal any arterial or venous abnormalities that may impact the repair.

Preoperative Imaging

Computed Tomography

CT angiography (CTA) with three-dimensional reconstructions, which allows for accurate anatomic measurements of a vessel's true cross-sectional diameter and center-line length is useful for planning open repair. CTA visualizes aneurysm angulation, arterial tortuosity, arterial wall calcification, and intravascular thrombus which is useful for planning the best approach and clamp sites. A detailed view of the proximal aneurysm neck allows the involvement of the visceral aortic segment to be accurately determined. From this, the need for a suprarenal or supraceliac clamp site can be made and potential clamp sites examined for the presence of heavy or circumferential calcification or thrombus. Concomitant occlusive disease of the visceral vessels and aortoiliac segment is also readily apparent on CTA, allowing decisions regarding the need for endarterec-tomy or complex reconstruction to be made preoperatively.

CTA also provides valuable information about the venous and visceral anatomy that might alter the operative plan; the presence of a retroaortic or circumferential

renal vein has implications on selecting the surgical approach and obtaining adequate exposure. Likewise, multiple renal arteries or a horseshoe kidney can affect both clamp site selection and arterial reconstruction. Appropriate visualization of the distal anatomy is also important. Concomitant stenotic, occlusive, or aneurysmal disease will influence the site of distal reconstruction, as well as the need for additional procedures. For example, additional graft limbs may be needed to preserve IMA or hypogastric flow. In addition, severe stenotic or occlusive disease can be bypassed at the time of the reconstruction.

Finally, the rate of incidental findings on CTs obtained for AAA is not inconsequential,[35] [36] and in certain circumstances, such as the diagnosis of an advanced malignancy, may take precedence over aneurysm repair.

Magnetic Resonance Angiography

Magnetic resonance angiography (MRA) may also be used for preoperative planning. It has been shown to be just as accurate as CT in the determination of aneurysm size and extent, as well as in the evaluation of concomitant occlusive disease[37] [38] [39].In patients with inflammatory aneurysms it may offer more information regarding the extent of the inflammatory process. MRA, however, does not offer information on the extent of calcification and sometimes can overestimate stenotic disease.

OUTCOMES AFTER OPEN REPAIR OF ABDOMINAL AORTIC ANEURYSMS:

Early Mortality

Perioperative mortality following open aneurysm repair is outstanding, with superb outcomes achieved in every large study examined. Historically in the 5% to 8% range, early mortality in large database, multi-institutional, and population-based studies now approaches 3%[40 41 42 43]. Similar results of an overall mortality rate of 3.5% are obtained when examining the open arms of the major randomized controlled trials for EVAR.

Table1: Results from Open Aneurysm Repair Arms of Major Randomized EVAR Trials[44 45 46 47]

Trial	**Publication Year**	**Open-Arm Participants**	**Mortality**
DREAM	2004	174	4.6%
OVER	2009	437	3.0%
EVAR-1	2010	626	4.3%
ACE	2011	149	1.3%
COMBINED RESULTS		**1386**	**3.5%**

Long-Term Survival:

Following aneurysm repair, age, cardiovascular disease, and cancer are the key drivers of long-term survival[48]. This was originally reported in 1981 in E. Stanley Crawford's landmark series, and it continues to be true to this day. Late graft complications do not significantly contribute to postoperative death[49] [50] [51]. This likely explains the similar mortality rates in randomized trials comparing EVAR and open aneurysm repair. In the recent 10-year follow-up to the OVER trial, survival in the open arm was 77% at 10 years. The leading causes of death were cancer and non–aneurysm-related cardiovascular disease in 11% and 6.6% of the participants, respectively, and accounting for 52% of the mortality.[52]

In the recently published EVAR -1 trial 15 year follow up results, the total aneurysm related survival at the end of 15 years was 87.9%. Although the all cause survival at 15 years was 23.8%.[53] These studies clearly show that the surgery is associated with good long term survival and non aneurysm related issues are the main cause of long term mortality.

Functional Outcome

With the exception of urgent cases aortic aneurysm repair is an elective, preventative operation designed to prolong life. Understanding how open repair affects quality of life measures is an essential part of appraising its outcome. Most studies examining functional outcomes following open repair do so in comparison with EVAR. They demonstrate that open repair, as compared with EVAR, is associated with significant reductions in physical function, vitality, and emotional role components of SF-36, and that these difference persist for up to 3 months[54]. Additionally, patients who underwent open repair had a 1-week longer length of stay and a greater utilization of both home care and inpatient rehabilitation[55 56]. In patients undergoing EVAR, average recovery time was 32 days; at 3 months, 95% of patients felt they had fully recovered. On the other hand, patients who had open repairs took an average of 99 days to recover, and only 75% felt fully recovered at 3 months[57]. Ultimately, though, no differences in late outcomes with respect to functional status were noted between the two studies.

MATERIALS AND METHODS

Over a period of 8 years from January 2008 to August 2016, 165 patients who underwent conventional open repair for elective abdominal aortic aneurysms were included in the retrospective analysis to look for early and long term outcomes, survival, complications and reinterventions in this cohort. We also studied the factors which influence the outcome and reinterventions in this group of patients. This cohort included the patients presenting with symptomatic or asymptomatic infrarenal abdominal and juxtarenal abdominal aortic aneurysms, all presenting in the elective setting. Suprarenal, Type 4 Thoracoabdominal aortic aneurysms, ruptured abdominal aortic aneurysms and isolated iliac artery aneurysms were excluded from the study. Approval was obtained from the Technical Advisory Committee (TAC) and Institutional Ethics Committee (IEC) for the conduct of the study.

Demographics, preoperative, perioperative and postoperative data were recorded in a structured data collection sheet after reviewing patient records and institutional electronic medical records. Patients undergoing elective repair underwent diagnostic work-up with chest radiograph, computed tomography (CT) angiography and work up for fitness included, complete haemogram, renal and liver functions test, coagulation profile, pulmonary function test and basic cardiac

work-up with electrocardiogram (ECG) and echocardiogram (Echo). Institute protocol involves evaluating all patients with coronary angiogram (CAG) for preoperative cardiac risk stratification and coronary optimisation if a significant lesion is detected on CAG, in all elective abdominal aortic aneurysms. Most of the patients underwent CAG for the same with few exceptions.

Renal dysfunction was defined as serum creatinine greater than or equal to 1.5mg/dl and increase of >0.5mg% was considered in postoperative period. Coronary artery disease was defined as history of acute coronary syndrome, prior coronary angioplasty or CABG or indirect evidence of myocardial ischemic damage in ECG or Echo or coronary lesion confirmed on CAG.

Perioperative myocardial infarction :

Perioperative acute coronary syndrome defined as a rise and fall in a cardiac bio-marker, mainly cardiac troponin, along with any one of the following,

1. Symptoms of ischemia.
2. Electrocardiographic evidence of ischemia, ST-T wave changes or left bundle branch block.
3. Development of pathologic Q waves.
4. Imaging showing loss of viable myocardium or a new abnormal LV wall motion.

Operative planning:

All patients underwent CT angiography, most of which were done using the institute's 256-slice CT scanner. Axial, multiplanar reconstruction (MPR) and Volume-rendered technology (VRT) images were examined by the radiologists and exact measurements of length and maximum diameter of the aortic aneurysm, Length of the aneurysm neck, origin of the viscero renal arteries, position of the left renal vein, status of the aortic bifurcation, the patency of the Inferior Mesenteric Artery (IMA), the size and the status of the Iliac artery and the femoral artery was also noted in all cases.

Open Surgical Repair :

Transperitoneal Approach:

Open repair of abdominal aortic aneurysm aneurysm was done under general anaesthesia. Third generative cephalosporin (Cefoperazone) antibiotic was always given during induction of anaesthesia and used to repeat at 4 hours of open surgery. Central venous pressure monitoring line either in internal jugular vein or subclavian vein, radial artery for proximal Mean Arterial Pressure (MAP) monitoring were placed in all patients.

After scrubbring and painting the area was draped from nipple to mid thigh level. Vertical midline Xypho-pubic celiotomy was done.The abdomen was carefully examined for any anomalies.

The small intestine was packed in a moist towel and placed outside the abdominal cavity. The retroperitoneum was incision along the right border of the aorta, between the duodenum and the inferior mesenteric vein, taking care not to injure the nervi erigentes. Lymphatics crossing in this area were ligated and divided. The left renal vein was identified and retracted cephalad with an IVC retractor. The lower renal artery is identified and the infrarenal aorta was dissected and clamp space created. Distally the right CIA was dissected and looped. The retroperitoneal tissue at the aortic bifurcation is preserved and a flap raised on the left side to identify the Left CIA and clamp space created. The iliac veins were identified and then the CIAs were dissected taking care not to injure the common iliac veins. In case a bifurcated graft was planned then the tunnels were created to the groin posterior to the ureter and anterior to the iliac artery.

After heparinisation with 1mg/kg unfractionated heparin (UFH), the CIA were clamped first and then the Infrarenal abdominal aorta was clamped. The aneurysm was opened preserving the IMA and the thrombus evacuated. The lumbar back bleeders were suture closed usuallywith 3.0 Polyester (TICRON) sutures. The

inferior mesenteric artery was managed as per the preoperative CT findings. IMA was usually ligated in most cases, but IMA reimplantation was done if needed.

Indications of IMA Reimplantation:

1. Poor or no back bleed from a patent IMA (By CT Angiogram)

2. Associated SMA or Celiac artery stenosis / occlusion

3. Bilateral internal iliac artery occlusion.

4. History of prior colectomy

5. Evidence of colonic ischemic changes at the end of the procedure

Proximally the aneurysm opened and a T- cut was made at the proximal end just below the neck of the aneurysm. Distally the T cut was made again similar to the proximal end.

The proximal anastomosis was fashioned with Polypropylene sutures with the anastomosis reinforced with a PTFE (Polytetrafluoro Ethylene) felt. The graft was clamped distal to the anastomosis and te aortic clamp was released to check for hemostasis at the proximal anastomosis. The distal anastomosis was also done with felt reinforcement using polypropylene sutures. After adequate hemostasis

was achieved and after informing the anesthetist , the clamps were released sequentially, one iliac after the other. Femoral pulses were checked and adequate flow confirmed.

Partial Heparin reversal done with Protamine sulphate and hemostasis achieved. The wall of the aneurysm wrapped around the graft and then the retroperioneum was closed. Abdomen closed in layers after replacing the bowel in the peritoneal cavity.

Juxtarenal AAA:

The management of patients with juxtarenal AAA involves the same steps of a standard infrarenal AAA with a few modifications. In most of these cases the LRV is anterior to the aorta. Patients with a normal renal function and eGFR (Estimated Glomerular Filtration Rate),we adequately mobilise the LRV and create space for the aortic cross clamping. Incase this is not successful, we divide the LRV just proximal to the LRV joining the Inferior Vena Cava (IVC). We identify and preserve the tributaries of the LRV as these channels later work as the draining pathways of the left kidney. Hence preserving the tributaries is an important step in the initial mobilisation of the LRV. Division of these tributaries and later division of the LRV will be detrimental to the left renal venous drainage.

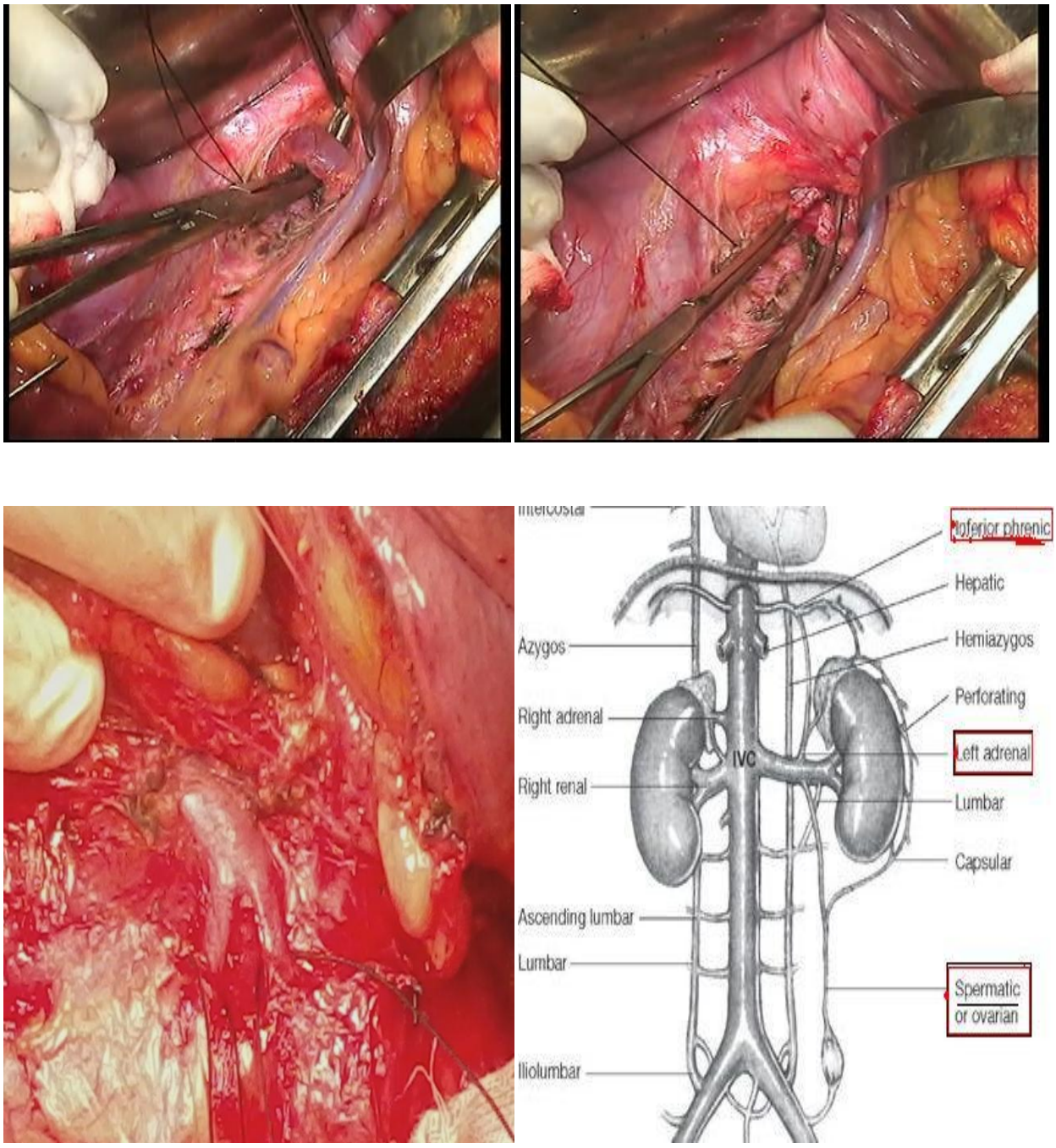


Figure 1: Images showing the mobilization of the left renal vein (LRV), its division over clamps, tributaries of the LRV as shown in the picture and the diagram.

Hiatal Aortic Dissection and Cross Clamping:

This maneuvre is needed when there is no infrarenal clamp space available ina patient with a precious left kidney. A temporary hiatal (supraceliac) aortic cross clamping will be useful in occasional patients. The lesser omentum is opened and the lesser sac entered. The Esophagus is retracted laterally to the left and the left crus of the diaphragm is divided. The Hiatal aorta can be seen here and dissected and clamp space created. Occasionally the left triangular ligament of the left lobe of the liver needs to be divided and the left lobe folded and retracted to the right to create more space to aid hiatal dissection.

Inter-renal aortic cross clamping:

In case there is some space between the renal arteries on CT angiogram, the aorta can be clamped in the inter-renal area with the lower renal artery being temporarily perfused during the clamp time with cold RENOPLEGIA solution to reduce the renal ischemia time. Renoplegia is prepared at the start of the procedure with Cold Saline, Sodium bicarbonate, Hydrocortisone, Heparin and papaverine and initially 500ml of the solution given rapidly and then the next 500ml of the solution slowly over the duration of the aortic cross clamp. We use Pruitt - Inahara shunt for selective renal perfusion during this procedure.

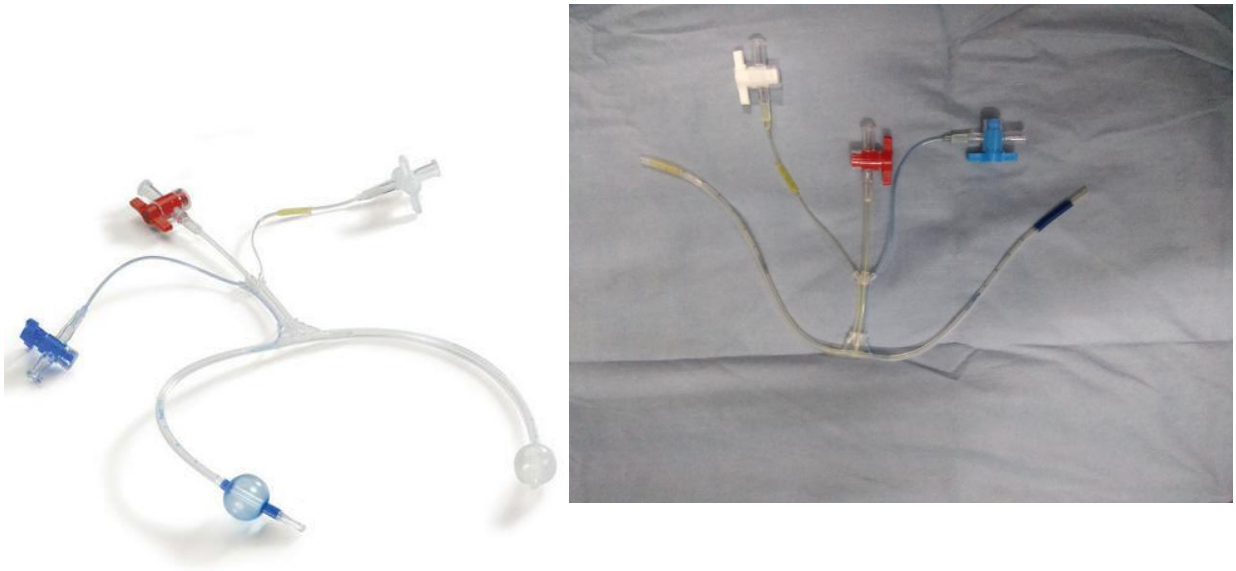


Figure 2: Pruitt - Inahara Shunt - has 2 cuffed ends with a side port for monitoring.

"RENOPLEGIA" (COLD RENAL PERFUSATE) SOLUTION:

N. Saline	400cc
Mannitol	40cc
Soda bicarbonate	40cc
Heparin	2000 I U
Papavarin	30mg
Hydrocortisone	100mg

Data recording and analysis : Perioperative, all events were identified and recorded through review of patient records and the hospital's electronic medical records (EMR). Aortic disease related mortality included death from any cause within 30 days of the primary procedure or any secondary intervention. Statistical analysis was done using the Chi-Square test, Log Rank test and Kaplin-Meyer Survival analysis. All data analysis was done using the Windows Excel 2007 and SPSS statistical analysis software.

Outcomes analysed:

Primary outcomes:

1) **Long term laparotomy related and graft related reinterventions**
2) **Long term Survival.**

Secondary outcomes:

1) **Perioperative Morbidity.**
2) **Perioperative Mortality.**

The Laparotomy(Wound) related reinterventions included Incisional hernia, Acute intestinal obstruction and Suture sinuses which require surgical intervention.

The Graft related reinterventions included Anastomotic stenosis with symptoms, Graft limb occluion/thrombosis, Anastomotic pseudoaneurysms and graft infection all requiring surgical/endovascular interventions.

RESULTS

During the period of 8 years from 2008 to 2016, 165 patients underwent elective open surgical repair of abdominal aortic aneurysms. The mean age of the patient cohort was 64.9 years with majority (92.7%) of them being a male cohort (13:1 male : female), Patients were followed up until May 31,2017 (Mean follow up 39.7 months, Median 34.9 months , Range 6 m to 110.6 months)

The mean size of the aneurysm was 6.8cm (range from 4.0 to 14cm, SD= 1.7).

96.4% of the patients were hypertensives and 86.7% were smokers (Table-2)

Table 2- Demographic details and risk factors of patients undergoing open repair of abdominal aortic aneurysm

Demographic factor	Percentage (number) [n-165]
Age (yrs)	64.9 (21-83)
Male:Female	13:1
Risk Factors	
HTN	96.4% (159)
DM	11% (18)
Renal dysfunction	16.4%(27)
COPD	4.2%(7)
Smoking	86.7% (143)
Co existing Systemic Disease	
CAD	54%(89)
PAD	12.7%(21)

CAD = coronary artery disease, COPD = chronic obstructive pulmonary disease, HTN=hypertension, DM=Diabetes mellitus, PAD = Peripheral artery disease.

Smoking History:

This group was divided into three categories based on the current smoking habits. Active smokers were defined as patients who have been smoking until the last 6 weeks. Reformed smokers were defined as patients who stopped smoking atleast 6 weeks before the date of surgery and non smokers were the patients who have never smoked (Figure-3)

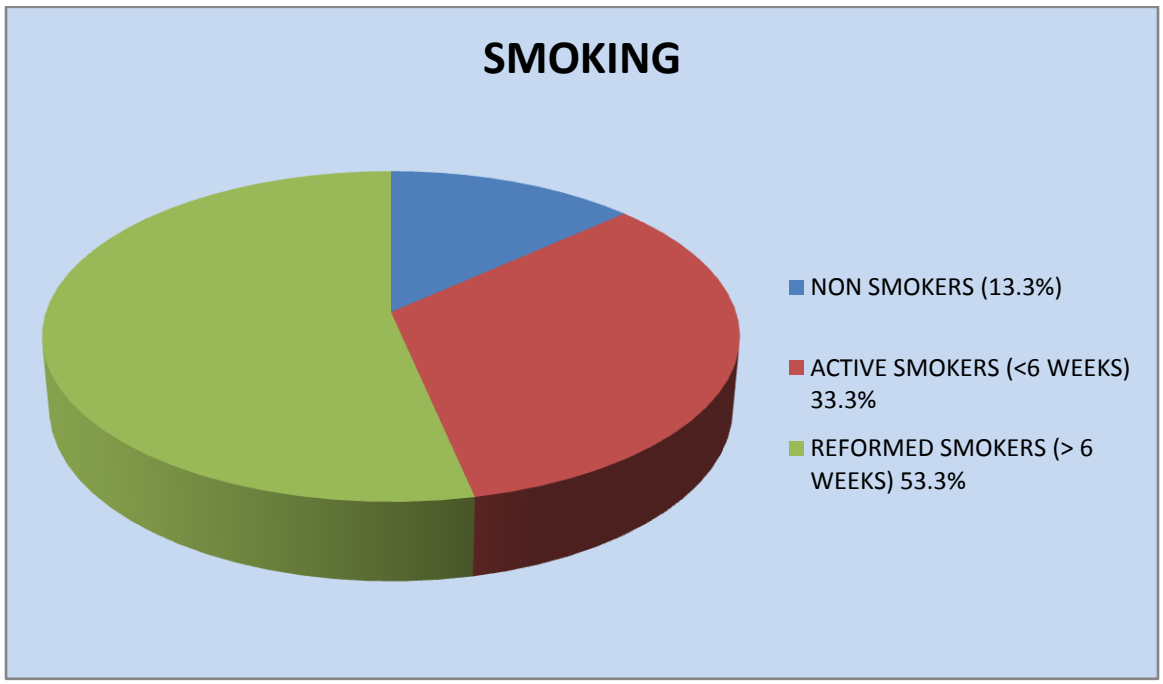


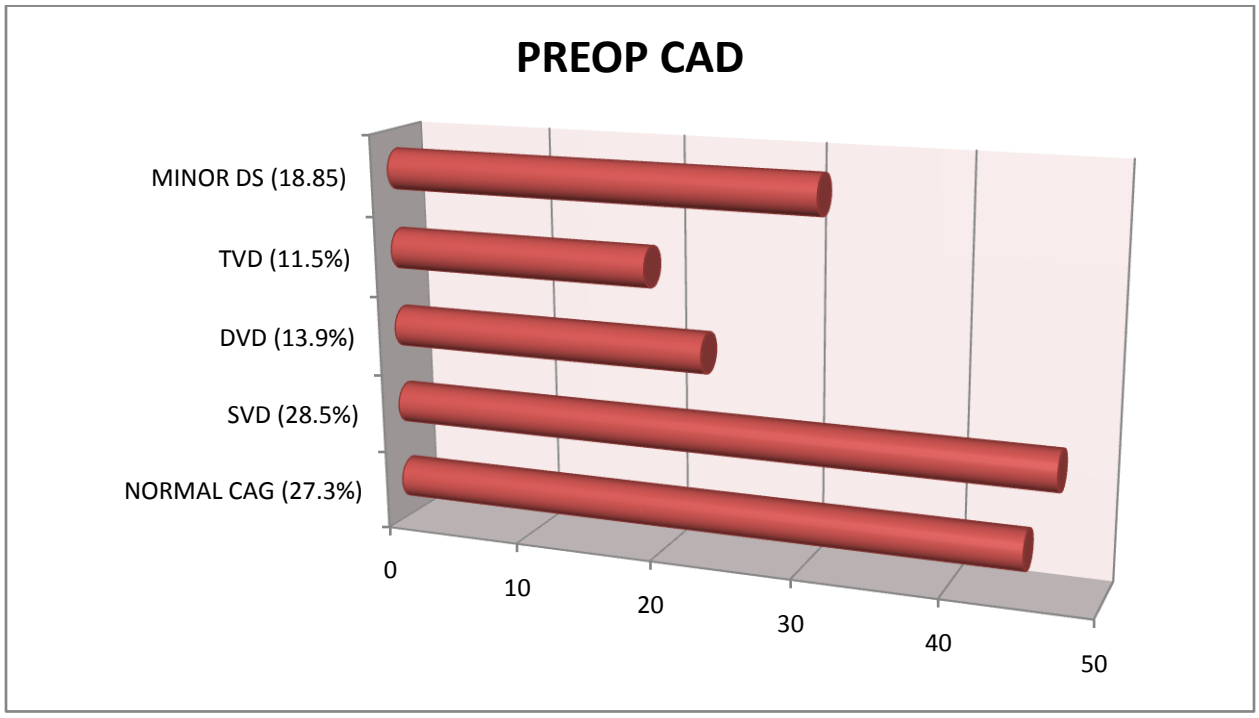
Figure 3 : Pie chart showing the distribution of smoking in the cohort

Preoperative Coronary Status:

All patients with elective abdominal aortic aneurysms undergo coronary imaging (CT Coronary Angiogram or Catheter CAG) as an institutional protocol.

Most of the patients underwent conventional catheter CAG with only a few patients undergoing CT CAG. The CAG findings were divided into 5 groups for stratification Normal CAG, Mild / minor disease (Minor plaques and stenosis < 50%), Single vessel disease > 50%, Double vessel disease (DVD) and Triple vessel disease(TVD). The incidence of each group in the cohort is given in table.(Figure-4)

Figure 4 :Bar diagram showing Preoperative coronary status of the patients



Coronary status	Frequency (n-165)	Percent
Normal CAG	45	27.3
SVD >50%	47	28.5
DVD	23	13.9
TVD	19	11.5
Minor CAD	31	18.8

Table-3 Coronary status of patients undergoing open repair of abdominal aortic aneurysm

The overall incidence of Significant coronary artery disease was seen in 89 patients (53.9%). Of this group 32 patients (19.4%) underwent some form of coronary intervention, either Percutaneous coronary intervention (PCI) or Coronary artery Bypass grafting(CABG) before surgery. (Table-3)

Type of aneurysm-

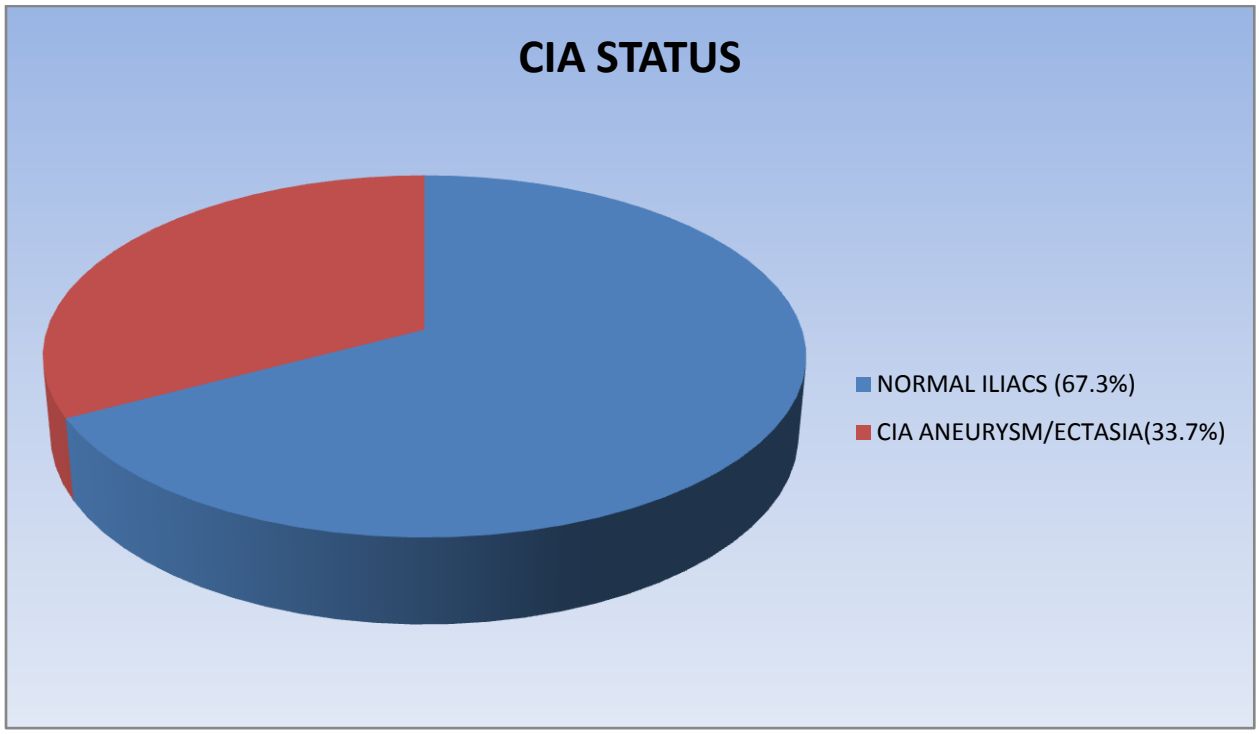
JRAAA was present in 29 patients (17.6%) among which 26 patients required left renal vein division during surgery for proper exposure of the aneurysm neck. Common iliac artery aneurysm (unilateral/bilateral) was present in 53 (32.1%) patients in this cohort **(Table-4)**

INFRARENAL OR JUXTARENAL	Frequency	Percent
IRAAA	136	82.4
JRAAA	29	17.6
Left renal vein divided	26	
Left renal vein not divided	3	

Table 4: Type of aneurysm in the cohort and status of renal vein division in the juxtarenal AAA group.

Common iliac artery aneurysms associated with AAA.

54 (33.1%) of the cohort had common iliac artery aneurysms requiring repair during the primary surgical intervention. (Figure -5)

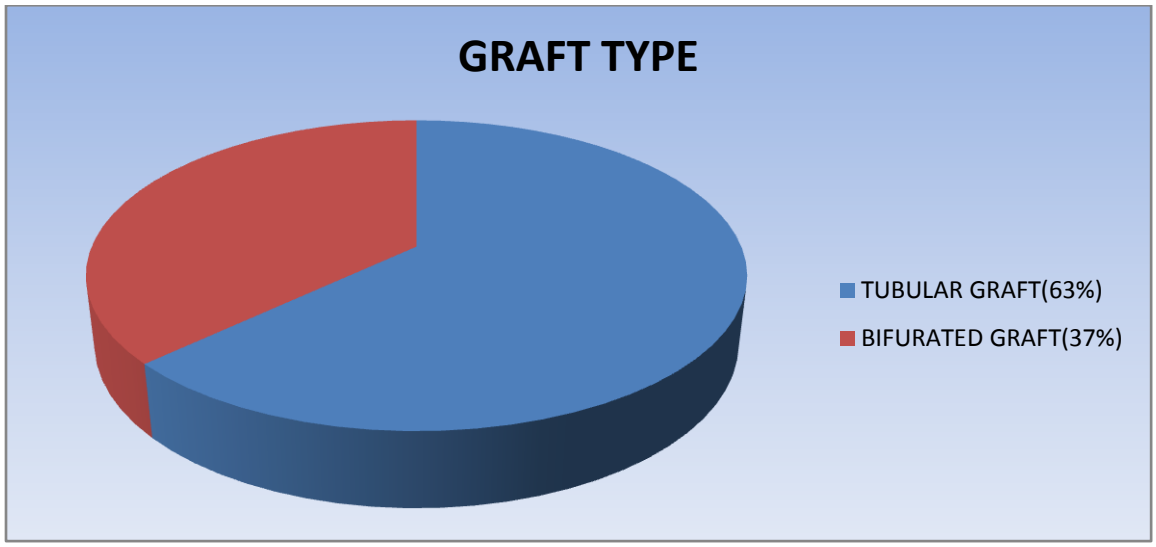


CIAA	Frequency	Percent
Absent	111	67.3
Present	54	33.7
Total	165	100.0

Figure 5 : Pie chart and the table showing incidence of common iliac artery aeurysms.

Graft type used :

104 patients (63%) underwent Endoaneurysmoraphy with a tubular graft, whereas 61 patients (37%) underwent surgery with a bifurcated graft (aorto bifemoral or aorto biliac). All patients with CIA aneurysms underwent surgery with bifurcated grafts.In 6 patients with only AAA, bifurcated graft were used as the aortic bifurcation was calcified or stenotic (Figure-6)



GRAFT TYPE	Frequency	Percent
Tubular	104	63.0
Bifurcated	61	37.0
Total	165	100.0

Figure 6: Pie chart and table shows the incidence of usage of bifurcated graft.

SHORT TERM OUTCOMES:

Early mortality was 2.4%. 2 patients died due to renal failure, 1 patient due to excessive intraoperatie bleeding and 1 patient due to perioperative myocardial ischemia. 5 (3.0%) patients developed signs of acute coronary syndrome, confirmed by rising cardiac biomarkers and all were managed conservatively. One patient developed paraparesis which was treated with Cerebrospinal fluid (CSF) drainage, steroids and increasing the mean arterial pressure. Patient improved completely with timely intervention. One patient developed colonic ischemia and a Haartmans procedure was performed. 13.3% of the patients had transient renal dysfunction, most of whom improved with medical management. Of this group 3(1.8%) patients required temporary hemodialysis in the perioperative period. (Table-5)

Event	Frequency	Percent
Perioperative mortality	4	2.4%
Perioperative morbidity		
• *Cardiac morbidity*	5	3.0%
• *Respiratory morbidity*	12	7.3%
• *Renal dysfunction(transient)*	22	13.3%
• *Periop temporary hemodialysis*	3	1.8%
• *Paraplegia/paraparesis*	1	0.6%
• *Visceral ischemia*	1	0.6%
• *Early wound related complications*	7	4.2%
• *Periop wound infection*	10	6.1%
• *DVT*	1	0.6%

Table 5: Showing perioperative mortality and morbidity profile of the cohort.

LONG TERM COMPLICATIONS:

Long term complications were divided into Laparotomy Related Complications and Graft Related Complications.

1(0.6%) Patient had a graft thrombosis after 4 years after surgery, 2(1.3%) patients had anastomotic pseudoaneurysms and graft infections and 6(3.8%) patients developed graft limb occlusion/stenosis. Overall 11 patients (6.9%) had long term graft related complications.(Figure-7)

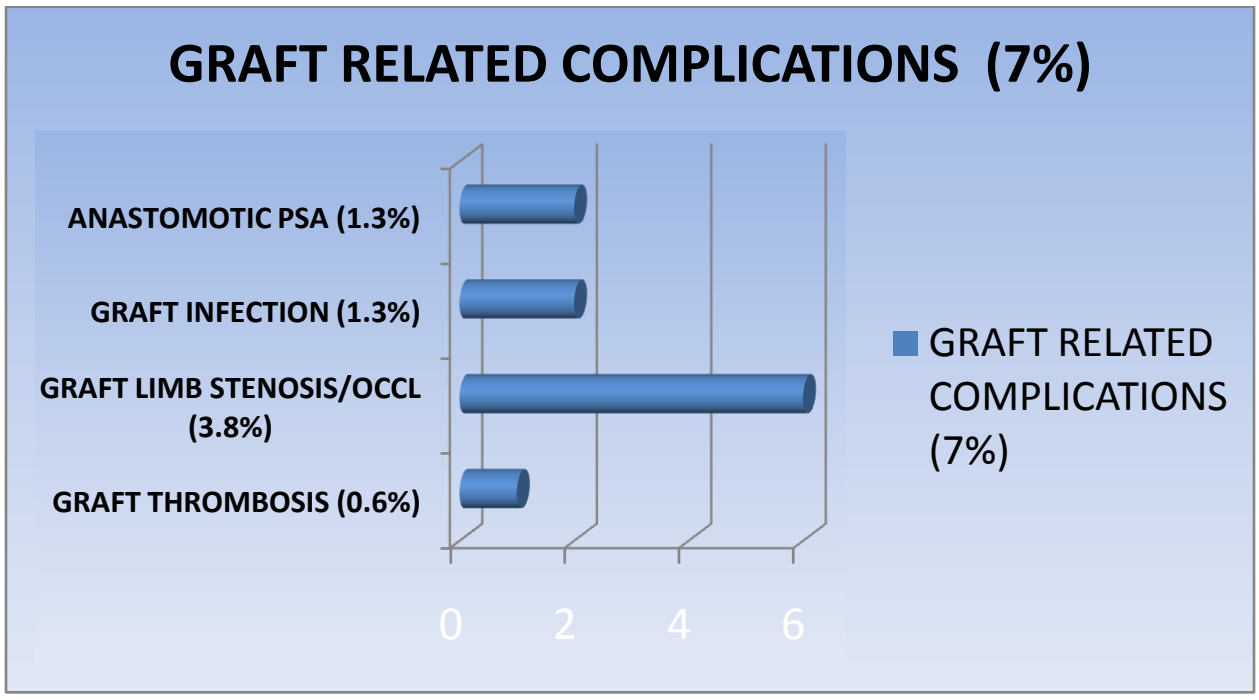


Figure 7 : Chart showing the incidence of graft related complications.

A total of 12 patients (7.6%) had significant laparotomy related complications including superficial skin infections (1.3%), intestinal obstruction, acute / subacute (2.5%) and incisional hernia in 3.8% of patients (Figure-8)

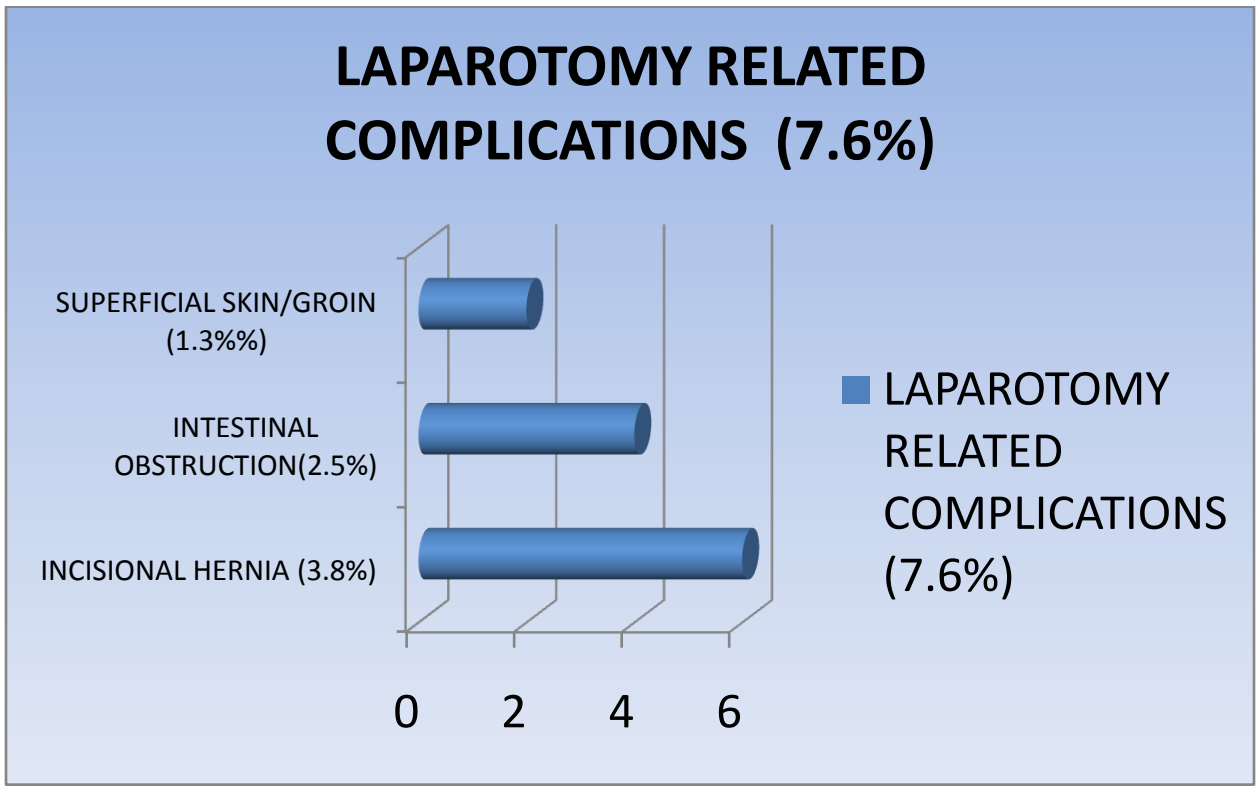


Figure 8 : Bar chart showing laparotomy related complications.

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LONG TERM MORTALITY:

A total of 161 patients were available for long term follow up. 3 patients were lost to follow up. Hence the long term follow up cohort was 158. With a mean follow up period of 39.7 months (Range from 0.6m to 110.6 months, SD 25.9), there were 12 mortalities in the long term follow up. Cardiac diseases were the most common cause of long term mortality (1.9%). 2 (1.3%) developed Gastrointestinal malignancies and succumbed after surgery. 3 (1.8%) patients died due to long term complications of aneurysm surgery. (Table-6)

LONG TERM MORTALITY (N= 158)	FREQUENCY	PERCENTAGE
TOTAL	***12***	***7.6%***
CARDIAC	3	1.9%
PROG. OF DS (METACHRONOUS TAAA)	1	O.6%
GRAFT OCCLUSION	1	O.6%
GRAFT INFECTION	1	O.6%
ANAS. PSA AND BLEED	1	O.6%
MALIGNANCY	2	1.3%
CRF	1	O.6%
UNKNOWN	1	O.6%

Table 6: Showing the causes for long term mortality.

LONG TERM SURVIVAL :

The Mean duration of survival after open repair of abdominal aortic aneurysms was 83.5 months with SD of 2.6 (95% CI of 78.4 - 88.6m) with 5 year survival rate of 85%. (Figure-9, Table-7)

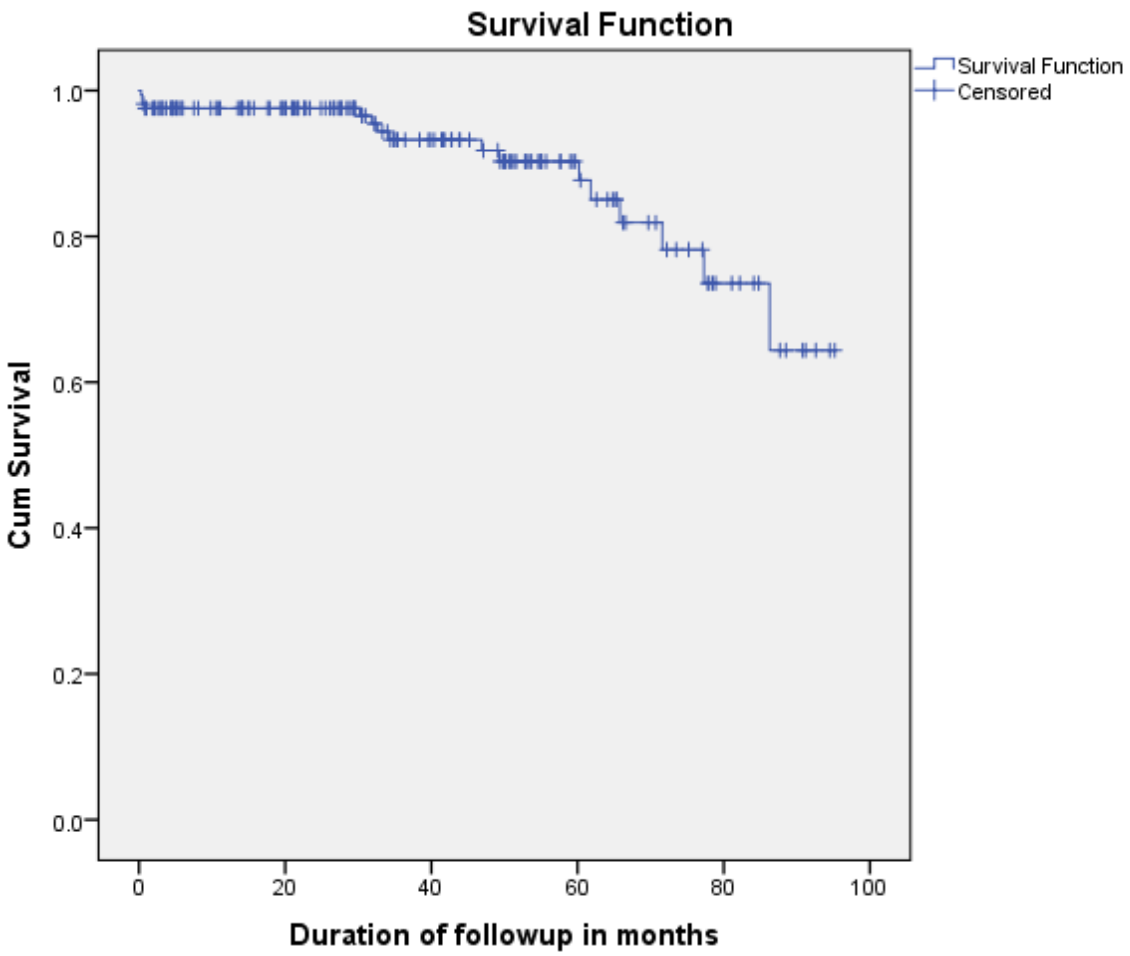


Figure: 9 : Kaplan Meier curve showing the long term survival in the cohort.

Duration of survival in months			
		95% Confidence Interval	
mean	Std. Error	Lower Bound	Upper Bound
83.544	2.600	78.448	88.639

Table 7: Shows mean duration of survival and confidence intervals.

LONG TERM REINTERVENTIONS:

The overall long term reintervention rate was 8.8%. The reinterventions were divided into Graft related and Laparotomy related reinterventions.(Figure 10)

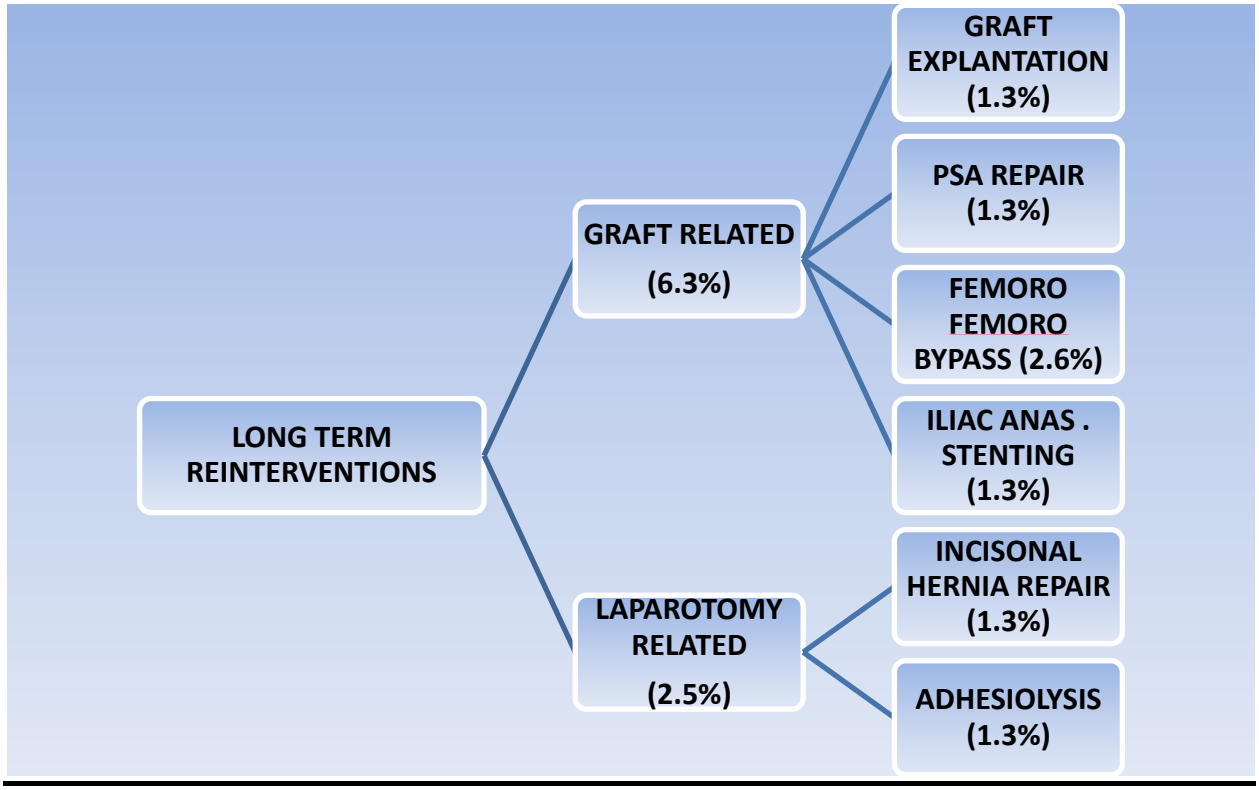


Figure 10: Flow chart shows the long term graft and laparotomy related reinterventions.

LAPAROTOMY RELATED REINTERVENTIONS:

Of the 12 (7.6%) patients who had laparotomy related complications, 4 (2.5%) patients needed reinterventions. 2 patients (1.3%) underwent incisional hernia repair and 2 patients (1.3%) underwent adhesiolysis for small bowel obstruction.(Figure-11)

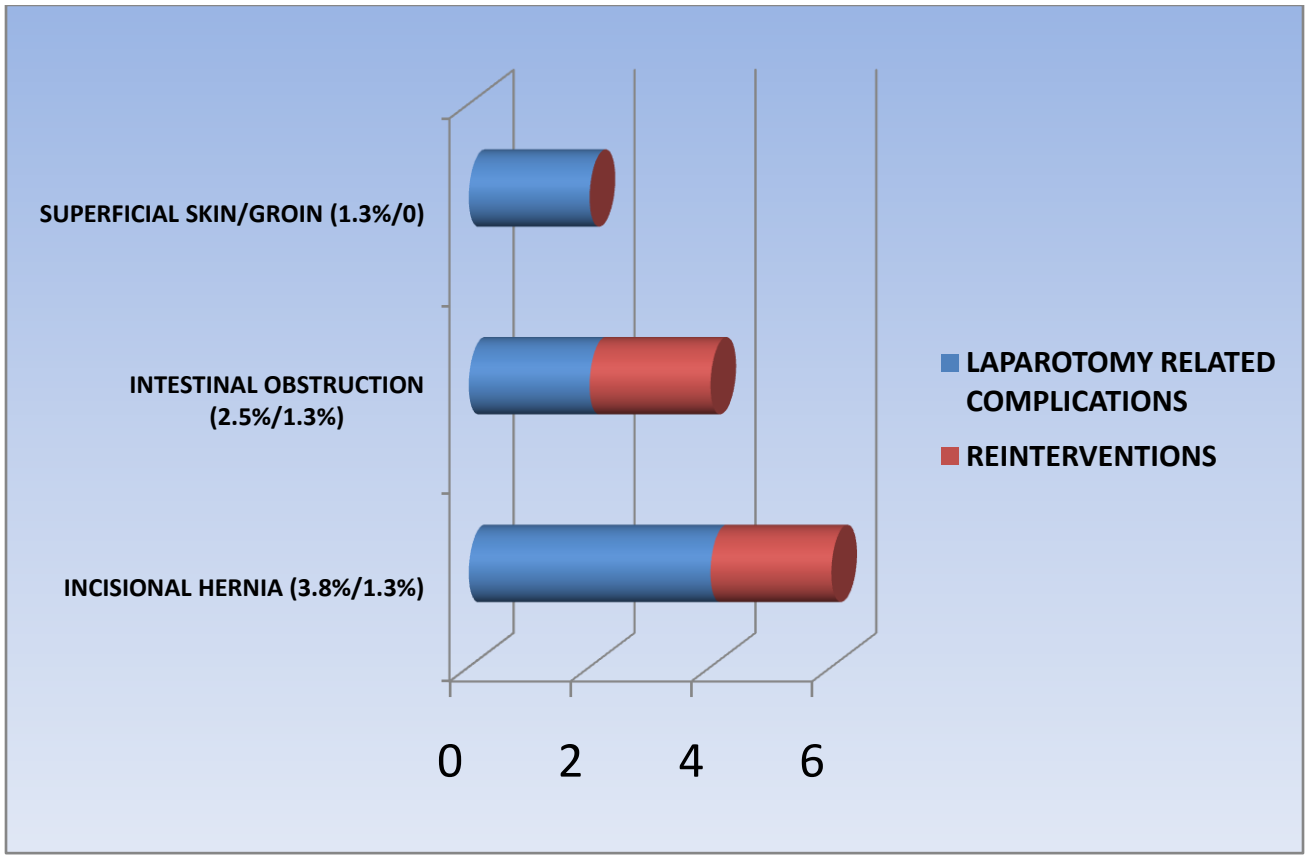


Figure 11: Bar chart shows the incidence of laparotomy related complications and associated reinterventions.

GRAFT RELATED REINTERVENTIONS:

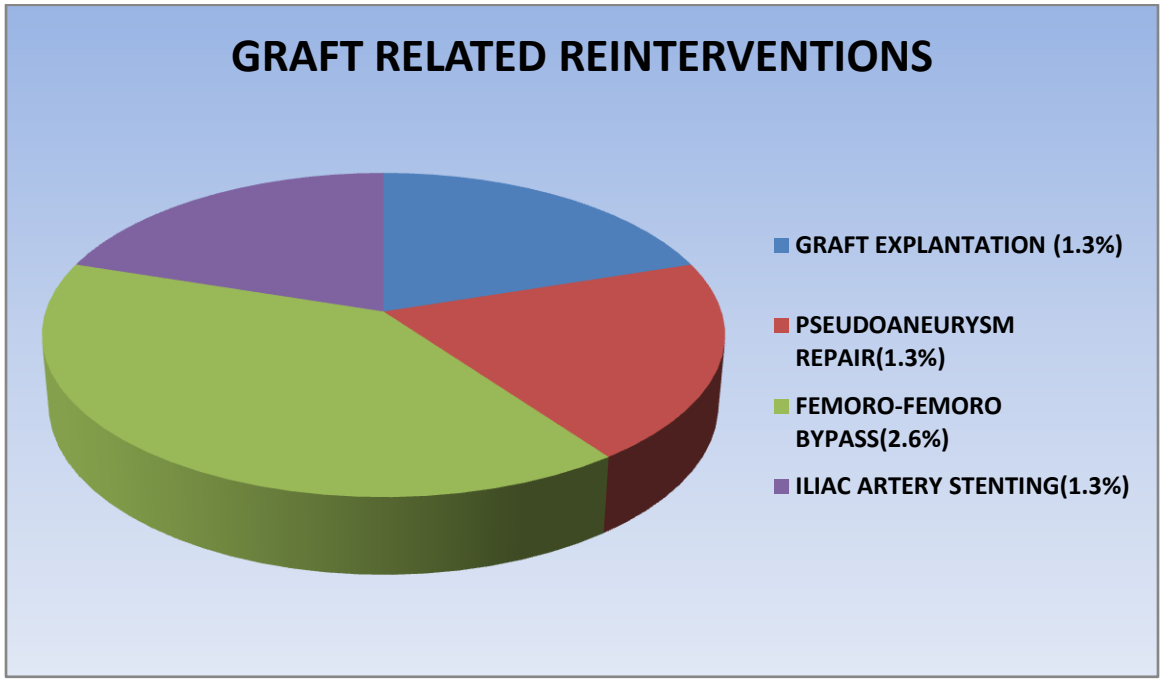


Figure 12: Pie chart showing graft related reinterventions.

Overall 10 of the 11 patients who developed chronic graft related complications underwent intervention . 2 patients (1.3%) underwent graft explantation and extra-anatomic bypass for graft infection. 2 patients underwent repair of anastomotic pseudo aneurysm. 4 patients (2.6%) developed stenosis/occlusion at the iliac anastomosis and underwent crossover Femoro-femoral bypass. 2 patients underwent iliac stenting for stenosis at the iliac anastomosis. One patient had severe dehydration following gastroenteritis and developed graft thrombosis and presented late to our institute with features of septicemia, renal failure and MODS (Multiorgan dysfunction) and died.(Figure-12)

SURVIVAL AFTER GRAFT RELATED REINTERVENTIONS:

The morbidity associated with graft related reinterventions is affected on the overall survival of patients with graft related complications as depicted in the following Kaplan Meier analysis (Figure-13). The mean duration of survival for patients with graft related complications was 61.8 months (95% CI 59.6 - 71.9) as compared to 83.5 months for patients without graft related complications and reinterventions.

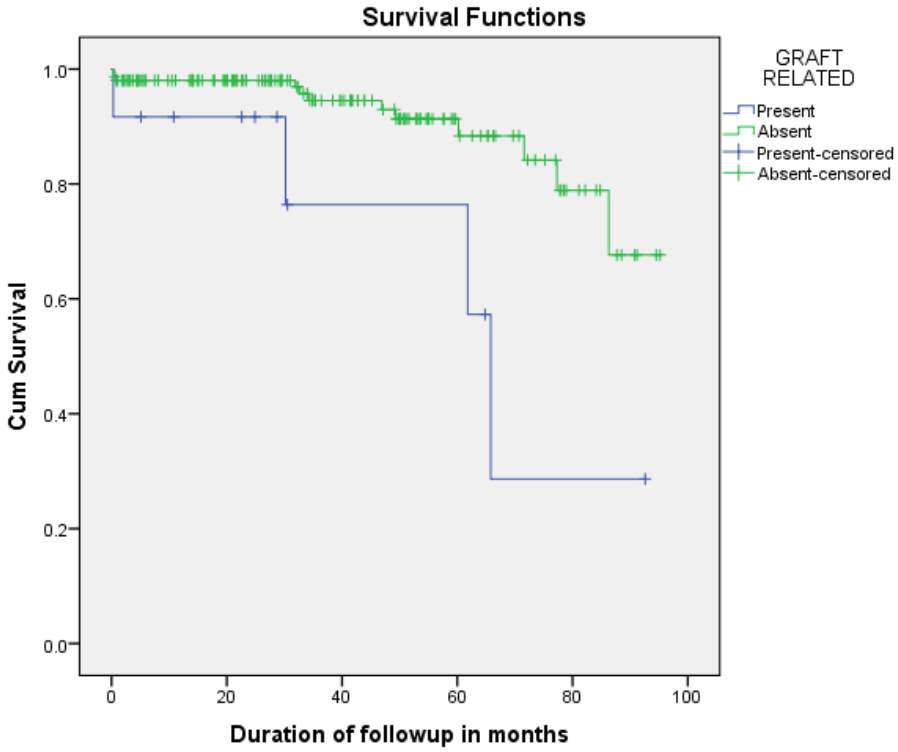


Figure 13: Kaplan Meier curve showing survival after graft related reinterventions (Blue Line)

REINTERVENTION FREE SURVIVAL:

The Reintervention Free Survival in the cohort was 85.7 months.

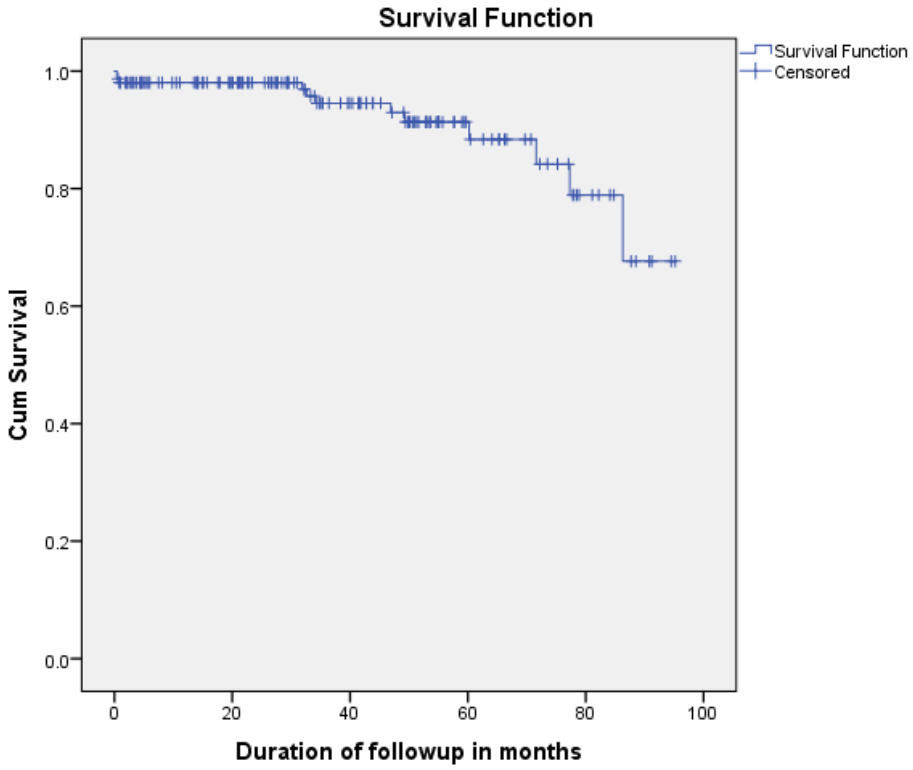


Figure 14: Kaplan Meier curve showing Reintevention free survial.

FACTORS INFLUENCING LONG TERM GRAFT RELATED AND LAPAROTOMY RELATED REINTERVENTIONS:

Age, Sex, Hypertension, Peripheral arterial occlusive disease and Dyslipidemia did not show any statistical significance in both the groups of laparotomy and graft related reinterventions. Other factors were individually analyzed in each category.

LAPAROTOMY RELATED REINTERVENTIONS:

Presence of a perioperative abdominal wall dehiscence was the only statistically significant variable which was related to long term laparotomy related reinterventions (4.2% patients, p=<0.001). History of smoking, diabetes mellitus, COPD, perioperative wound infections, respiratory infections did not statistically influence the long term laparotomy related reinterventions (Table-8).

FACTORS	*NUMBER*	*SIGNIFICANCE (p Value)*
• *SMOKING*	*143*	*0.101*
• *DIABETES MELLITUS*	*18 (10.9%)*	*0.649*
PERIOP ABD WALL DEHISCENCE	*7 (4.2%)*	*<0.001*
PERIOP WOUND INFECTION	*10 (6.1%)*	*0.142*
PERIOP RESPIRATORY INFECTIONS	*12 (7.3%)*	*0.241*
COPD	*7 (4.2%)*	*0.429*

Table 8: Showing significance of each parameter in influencing laparotomy related reinterventions.

GRAFT RELATED REINTERVENTIONS

Diabetes mellitus, use of bifurcated graft, perioperative wound infections and abdominal wall dehiscence were associated with long term graft related complications and needed reinterventions. Other parameters assessed did not show statistical significance (Table-9)

FACTORS	*NUMBER*	*SIGNIFICANCE (p Value)*
• *SMOKING*	*143*	*0.438*
• *DIABETES MELLITUS*	*18 (10.9%)*	*0.001*
• *CIA LESIONS*	*54 (33.1%)*	*0.054*
• *BIFURCATED GRAFT*	*61 (37%)*	*0.001*
• *PERIOP ABD WALL DEHISCENCE*	*7 (4.2%)*	*<0.027*
• *PERIOP WOUND INFECTION*	*10 (6.1%)*	*<0.001*
• *PERIOP RESPIRATORY INFECTIONS*	*12 (7.3%)*	*0.314*
• *COPD*	*7 (4.2%)*	*0.465*

Table 9: Showing significance of each parameter in influencing long term graft related reinterventions

DISCUSSION

Abdominal aortic aneurysm is a common disease that affects men usually older than 50 years. The risk of rupture of AAA increases as the size of the aneurysm increases. Traditionally the management of the aneurysm has been open repair with graft replacement. But since the early 1990s endovascular repair of AAA as gained lot of importance and is currently the mainstay of treatment in these patients with the advent of newer third generation devices and the operator experience has gained over time. The early results of EVAR have been promising with better perioperative morbidity and mortality as compared to open repair, as shown by all the major RCTs conducted till date, the DREAM trial, OVER trial, EVAR - 1 Trial. But the early survival benefit tends to be lost at 2 years of followup with more complications, readmissions, reinterventions in the EVAR group as compared to the open repair. Open repair on the other hand, when performed in a stable patient, has a better long term morbidity and mortality profile as shown by the results of the open group in the above mentioned trials.

In this study we have tried to look into the perioperative mortality and morbidity as well as the long term mortality, morbidity and reinterventions in our center. The perioperative mortality (2.4%) in this cohort is in comparison with the available

literature. This cohort consists of a decade younger population (Mean age : 64years) than most of the western literature.

Renal dysfunction was the most common perioperative morbidity in this cohort (13.3%) and was predominantly seen in patients with juxtarenal AAA and those with preoperative renal dysfunction. Majority of these patients improved with conservative medical management without the need for hemodialysis (Temporary hemodialysis in 1.8%) . Rates of postoperative renal insufficiency approach 10%[58]. A meta-analysis of patients undergoing open elective pararenal aortic aneurysm repair demonstrated postoperative renal insufficiency in 15% to 20% of the patients, but dialysis-dependent renal failure in 3.5%[59].

Cardiac diseases was the most common cause of the long term mortality but was comparatively less common in our study group (2% at 39.7m mean follow up) as compared to the EVAR-1 trial which recently published 15 year long term results. We attribute this to the extensive coronary work up with Coronary angiogram as a preoperative work up protocol at the institute. Also patients with significant coronary artery disease underwent preoperative intervention in 19% of our cohort which also contributed to the reduction in the postoperative cardiac events. In the long term results of the EVAR -1 trial, 22% coronary related mortality was reported at 4 years of follow up.[60] Aneurysm related mortality was again comparable to the published literature (1.8% vs 3% in the EVAR - 1 trial).

Graft limb occlusion was the most common graft related complication in our study. In the multivariate analysis, one of the factors that was statistically significant was usage of a bifurcated graft. Mostly the initial lesion started off as a stenosis and later on progressed to occlusions. Hence early detection of stenosis by clinical assessment of peripheral pulses and ABPI (Ankle Brachial Pressure Index) and duplex scan may pick up early lesions and appropriate intervention be planned.

Long term reinterventions were analyzed in this cohort with laparotomy related and graft related reinterventions. Any reintervention was documented at 8.8% (6.3% graft related and 2.5% laparotomy related). The EVAR -1 trial reported an incidence of 12% reintervention rate for open repair and 26% overall reintervention rate for EVAR at 15 years of follow up.

We also analysed factors influencing and predicting the long term reinterventions. Of all the parameters analysed only the perioperative abdominal wall dehiscence was statistically significant for long term laparotomy related reinterventions. That is patients with perioperative abdominal wall dehiscence are more prone to develop incisional hernia and adhesive small bowel obstruction in the follow up period.

Similarly, Diabetes mellitus, use of a bifurcated graft, perioperative abdominal wall dehiscence and perioperative wound infection were associated with graft related complications and reinterventions in the long term follow up.

EVAR prevents aneurysm rupture or enlargement by preventing the blood pressure to be transmitted to the aneurysm wall. Nevertheless, the disease remains in situ and continues to progress leading on to delayed endoleaks due to neck degeneration and enlargement. The reintervention rates related to aneurysm is hence high in EVAR (26%) as shown in EVAR -1 long term follow up. And in many cases the reinterventions for endoleaks needs extension cuff and sometimes needs more complex repairs like fenestrations/parallel grafts to gain additional proximal landing zone(For Type 1 Endoleak). It will also have a financial implication on the patient family as well. Even with open repair, the graft related reinterventions are complicated (eg. graft infection) as evidenced by the poor long term survival in patients who underwent graft related reinterventions when compared with those who did not. (62months vs 84 months- Figure 9 and 13)

Abdominal aortic aneurysm management has shown a dramatic change in the last 2 decades with most of the aneurysm repairs done by open approach in the beginning with most of the aneurysms being repaired by endovascular approach at present. EVAR is associated with high incidence of long term reinterventions as reported by all the RCTs conducted till date and hence need regular imaging and follow up. But open repair has traditionally stood the test of time with better long term outcomes. Hence the current need is to balance open surgical and endovascular skills by the treating surgeon. We believe that in our setup and Indian healthcare

as a whole, a good preoperative work up with open surgery in a fit patient provides good long term outcomes. EVAR is reserved for those patients with poor physiological reserve with anatomic suitability.

CONCLUSIONS

Open repair of abdominal aortic aneurysms is associated with good early and long term results.

Reinterventions rates are low and especially present in those with perioperative abdominal wall dehiscence (both graft and laparotomy related).Proper wound care in the perioperative period can avoid long term reinterventions.

In the current endovascular era, young patients with long life expectancy will benefit more from open surgical repair for AAA with better outcome and less reinterventions.

CLINICAL IMAGES

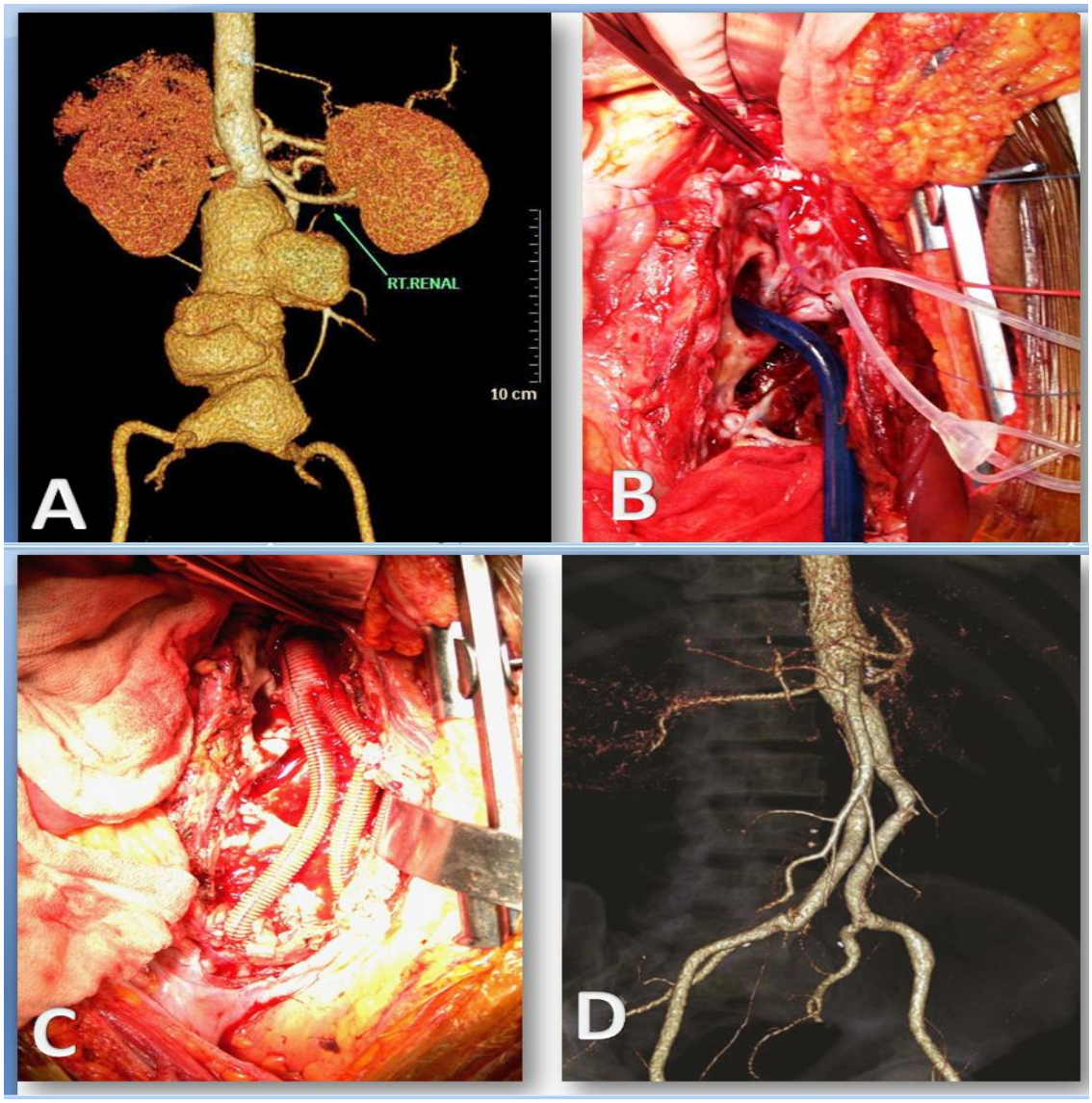


FIGURE 15 : Juxtarenal AAA. Preoperative CT VRT picture of the juxta renal AAA (A), intraoperative picture showing selective renal perfusion using a Pruitt-Inahara shunt (B), Intraoperative picture after graft implantation (C), CT VRT picture 6 months after the procedure (D).

APPENDIX

FACTORS INFLUENCING LAPAROTOMY RELATED REINTERVENTIONS:

LAPAROTOMY RELATED REINTERVENTIONS:

1.SMOKING

Smoking	Wound related reintervention				Total		χ^2	df	p
	Present		Absent						
	N	%	N	%	N	%			
Nonsmoker	4	18.2	18	81.8	22	100.0	4.582	2	.101
Active smoker <6 weeks	2	3.6	53	96.4	55	100.0			
Reformed smoker (> 6 weeks)	7	8.0	81	92.0	88	100.0			
Total	13	7.9	152	92.1	165	100.0			

2. PERIOPERATIVE ABDOMINAL WALL DEHISCENCE

ABD WALL DEHISCENCE	**Wound related reintervention - Long term**				Total		χ^2	df	p
	Present		Absent						
	N	%	N	%	N	%			
Present	3	42.9	4	57.1	7	100.0	12.323	1	<.001
Absent	10	6.3	148	93.7	158	100.0			
Total	13	7.9	152	92.1	165	100.0			

3. PERIOPERATIVE WOUND INFECTION

PERIOP WOUND INFECTION	**Wound related** reintervention - Long term				Total		χ^2	df	p
	Present		Absent						
	N	%	N	%	N	%			
Present	2	20.0	8	80.0	10	100.0	2.155	1	.142
Absent	11	7.1	144	92.9	155	100.0			
Total	13	7.9	152	92.1	165	100.0			

4. PERIOPERATIVE RESPIRATORY INFECTIONS

PERIOP COMP - RESPIRATORY	Wound related reintervention - Long term				Total		χ^2	df	p
	Present		Absent						
	N	%	N	%	N	%			
Present	2	16.7	10	83.3	12	100.0	1.377	1	.241
Absent	11	7.2	142	92.8	153	100.0			
Total	13	7.9	152	92.1	165	100.0			

5. DIABETES MELLITUS

DM	Wound related reintervention				Total		χ^2	df	p
	Present		Absent						
	N	%	N	%	N	%			
Absent	11	7.5	135	92.5	146	100.0	.207	1	.649
Present	2	10.5	17	89.5	19	100.0			
Total	13	7.9	152	92.1	165	100.0			

6. COPD (CHRONIC OBSTRUCTIVE AIRWAY DISEASE)

COPD	Wound related reintervention				Total		χ^2	df	p
	Present		Absent						
	N	%	N	%	N	%			
Absent	13	8.2	145	91.8	158	100.0	.625	1	.429
Present	0	0.0	7	100.0	7	100.0			
Total	13	7.9	152	92.1	165	100.0			

GRAFT RELATED REINTERVENTIONS:

1. SMOKING:

Smoking	Graft related reintervention				Total		χ^2	df	p
	Present		Absent						
	N	%	N	%	N	%			
Nonsmoker	3	13.6	19	86.4	22	100.0	1.651[a]	2	.438
Active smoker <6 weeks	4	7.3	51	92.7	55	100.0			
Reformed smoker (> 6 weeks)	5	5.7	83	94.3	88	100.0			
Total	12	7.3	153	92.7	165	100.0			

2.COMMON ILIAC ARTERY LESIONS:

CIAA	Graft related reintervention				Total		χ^2	df	p
	Present		Absent						
	N	%	N	%	N	%			
Absent	5	4.6	104	95.4	109	100.0	3.715	1	.054
Present	7	13.0	47	87.0	54	100.0			
Total	12	7.4	151	92.6	163	100.0			

3. GRAFT TYPE USED:

GRAFT TYPE	Graft related reintervention				Total		χ^2	df	p
	Present		Absent						
	N	%	N	%	N	%			
Tubular	2	1.9	102	98.1	104	100.0	11.938	1	.001
Bifurcated	10	16.4	51	83.6	61	100.0			
Total	12	7.3	153	92.7	165	100.0			

4. PERIOPERATIVE ABDOMINAL WALL DEHISCENCE

ABD WALL DEHISCENCE	Graft related reintervention				Total		χ^2	df	p
	Present		Absent						
	N	%	N	%	N	%			
Present	2	28.6	5	71.4	7	100.0	4.917	1	.027
Absent	10	6.3	148	93.7	158	100.0			
Total	12	7.3	153	92.7	165	100.0			

5. PERIOPERATIVE WOUND INFECTION

PERIOP WOUND INFECTION	Graft related reintervention Present N	%	Absent N	%	Total N	%	χ^2	df	p
Present	5	50.0	5	50.0	10	100.0	28.818	1	<.001
Absent	7	4.5	148	95.5	155	100.0			
Total	12	7.3	153	92.7	165	100.0			

Table : Shows a statistically significant relation with perioperative wound infections with long term graft related reinterventions with 50% of the patients with perioperative wound related infections will develop graft related reinterventions with a mean follow up period of 39.7 months (0.6m to 110.6m; SD = 25.9)

6. PERIOPERATIVE RESPIRATORY INFECTION

PERIOP COMP - RESPIRATORY	Graft related reintervention Present N	%	Absent N	%	Total N	%	χ^2	df	p
Present	0	0.0	12	100.0	12	100.0	1.015	1	.314
Absent	12	7.8	141	92.2	153	100.0			
Total	12	7.3	153	92.7	165	100.0			

7. DIABETES MELLITUS

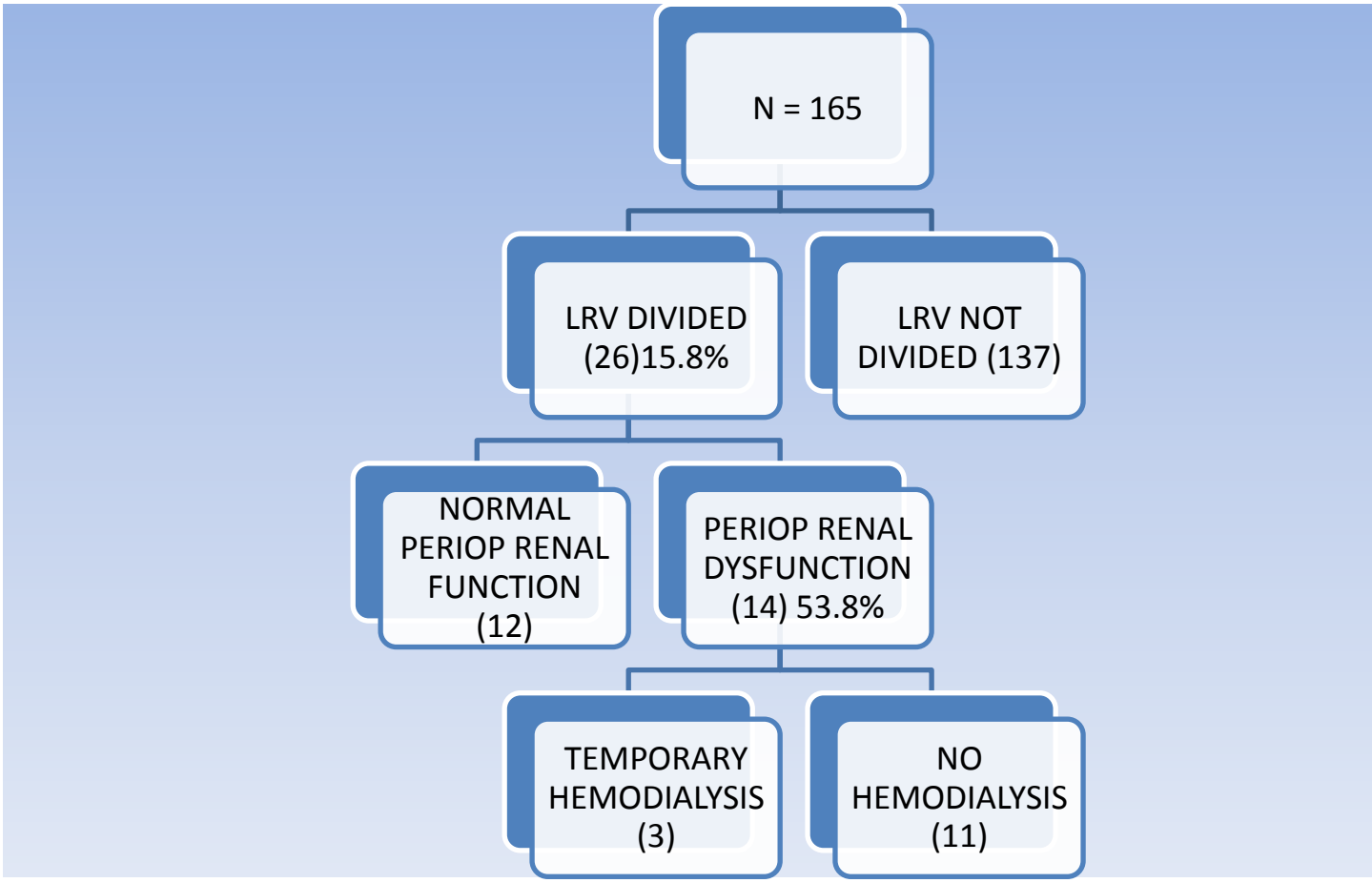
DM	Graft related reintervention				Total		χ^2	df	p
	Present		Absent						
	N	%	N	%	N	%			
Absent	7	4.8	139	95.2	146	100.0	11.547	1	.001
Present	5	26.3	14	73.7	19	100.0			
Total	12	7.3	153	92.7	165	100.0			

8. COPD (CHRONIC OBSTRUCTIVE PULMONARY DISEASE)

COPD	Graft related reintervention				Total		χ^2	df	p
	Present		Absent						
	N	%	N	%	N	%			
Absent	11	7.0	147	93.0	158	100.0	.533	1	.465
Present	1	14.3	6	85.7	7	100.0			
Total	12	7.3	153	92.7	165	100.0			

LEFT RENAL VEIN DIVISION:

Left renal vein division was necessary in 26 out of 29 juxta renal abdominal aortic aeurysms. Of this group of 26 LRV divisions, 14 patients had peri-operative renal dysfunction of which 3 patients needed Temporary hemodialysis. In the long term follow up, 4 patients had progressive renal dysfunction, but none requiring renal replacement therapy.



LRV DIVISION AND RENAL DYSFUNCTION:

	LRV						Fisher's
	Divided not reanastomosed		Divided and reanastomosed		Total		Exact test
PeriOP RD	N	%	N	%	N	%	p
Absent	11	44.0	1	100.0	12	46.2	0.462
Present	14	56.0	0	0.0	14	53.8	
Total	25	100.0	1	100.0	26	100.0	

TABLE:

DELAYED RENAL DYSFUNCTION (LRV DIVISION)	LRV					
	Divided not reanastomosed		Divided and reanastomosed		Total	
	N	%	N	%	N	%
Absent	25	100.0	1	100.0	26	100.0
Total	25	100.0	1	100.0	26	100.0

TABLE:

Tables - - show that there was no statistically significant correlation between the left renal vein division (LRV) and perioperative and long term renal dysfunction.

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Institutional Ethics Committee
(IEC Regn No. ECR/189/Inst/KL/2013)

SCT/IEC/1027/APRIL-2017

04.05.2017

Dr. Prakash
Senior Resident
Department of CVTS
SCTIMST, Thiruvananthapuram

Dear Dr. Prakash,

The Institutional Ethics Committee reviewed and discussed your application to conduct the study entitled "REINTERVENTIONS AFTER CONVENTIONAL SURGICAL REPAIR OF ABDOMINAL AORTIC ANEURYSM - RETROSPECTIVE ANALYSIS (IEC/1027)" on 15th April, 2017.

The following documents were reviewed:

Original submission

1. *Covering Letter addressed to the Chairperson, IEC, SCTIMST with checklist*
2. *TAC Approval Letter*
3. *IEC Application Form*
4. *Project Proposal*
5. *Project Protocol*
6. *CV of Principal Investigator and Co-Principal Investigators*

Revised submission

1. *Covering letter addressed to the Chairman, IEC, SCTIMST dated 29.04.2017 with check list*
2. *TAC Approval Letter*
3. *IEC Application Form*
4. *Project Proposal*
5. *Declaration Form*
6. *Proforma*
7. *CV of Principal Investigator and Co-Principal Investigators*

The following members of the Ethics Committee were present at the meeting held on 15th April, 2017 at G. Parthasarathi Board Room, AMCHSS, SCTIMST

SL. No.	Member Name	Highest Degree	Gender	Scientific /Non Scientific	Affiliation with Institution(s)
1.	Dr. R V G Menon	M Tech, PhD	Male	Lay Person (Chairman)	No
2.	Dr. Kala Kesavan. P	MBBS, MD	Female	Basic Medical Scientist	No
3.	Dr. Rema M. N	MD	Female	Basic Medical Scientist	No
4.	Dr. S S Giri Sankar	LL.M. Ph.D.	Male	Legal Expert	No
5.	Dr. Aneesh V Pillai	BA. LLB (Hons.), LLM, Ph. D, SET (Law)	Male	Legal Expert	No
6.	Mr. Satheesh Chandran	MSW, PGDPM	Male	Lay person/ NGO/ Social Scientist	No
7.	Smt. Sathi Nair	MA (English Literature)	Female	Lay Person	No
8.	Dr. P. Manickam	BSMS, MSc (Epid)., PhD.,	Male	Health Science Expert/ Social Scientist	No
9.	Dr. V. Raman Kutty	M D, M Phil, M P H	Male	Health Sciences Expert/Clinician	Yes
10.	Dr. K R S Krishnan	M.E., Ph.D.	Male	Medical Technology	Yes
11	Dr.Harikrishnan S	MD, DM (Cardiology) DNB (Cardiology)	Male	Clinician	Yes
12.	Dr. Mala Ramanathan	PhD	Female	Social Scientist (Member Secretary)	Yes

IEC Decision

The IEC approved the conduct of the study in the present form.

Remarks:
The Institutional Ethics Committee expects to be informed about the progress of the study, any SAE occurring in the course of the study, any changes in the protocol and patient information/informed consent and asks to be provided a copy of the final report.

There was no member of the study team who participated in voting / decision making process. The ethics committee is organized and operated according to the requirements of Good Clinical Practice and the requirements of the Indian Council of Medical Research (ICMR).

Sincerely,

Mala Ramanathan
Member Secretary, IEC

Technical Advisory Committee (Clinical Studies)

SREE CHITRA TIRUNAL INSTITUTE FOR MEDICAL SCIENCES & TECHNOLOGY
THIRUVANANTHAPURAM – 695011, INDIA

TAC Registration No: SCT-/S/2016/560 **Date:21.11.2016**

Project title: REINTERVENTIONS AFTER CONVENTIONAL SURGICAL REPAIR OF ABDOMINAL AORTIC ANEURYSM - RETROSPECTIVE ANALYSIS

Principal Investigator:
Dr. Prakash Degree: MBBS, DNB (General Surgery) Senior Resident, Division of Vascular Surgery, Department of CVTS, SCTIMST
Co-Principal Investigator(s)
1) Name: Dr. P Shivanesan Degree: MBBS, MS Senior Resident, Division of Vascular Surgery, Department of CVTS, SCTIMST
2) Name: Prof. M.Unnikrishnan, Degree: M.S, M.Ch(CVTS), FIACS, FVSI Senior Professor, Division of Vascular Surgery, Department of CVTS, SCTIMST

Members who participated in the TAC meeting on 05/11/2016
Dr. Rupa Sreedhar (Chairperson)
Dr. Mathew Abraham
Dr. Prasantakumar Dash
Dr. Sankara Sarma. P
Dr. Sylaja P.N
Dr. Krishna Kumar K
Dr. Syam. K
Dr. Bijulal S
Dr. Jayadevan E.R.
Dr. Varghese T. Panicker
Dr. K. Shivakumar (Member Secretary)

Dr. Rupa Sreedhar, Dr. Bijulal S, Dr. Prasantakumar Dash and Dr. Jayadevan E.R stayed away from the proceedings when the projects in which they are involved (# 532,533,538,543,544,545,547,550,559) as investigators were discussed.

Risk Classification of the project (Minimum/ Moderate/ High): Minimum
Requirement of DSMB: No
Recommended members of DSMB: Not applicable

Recommendations of TAC:
Recommended for consideration of IEC in the light of the responses received from the investigator

The PI may note that there can be no additions / alterations in the documents approved by TAC when they are submitted to the IEC.

Signature of the Member Secretary, TAC (Clinical Studies)

Note for IEC
Copy of the investigator's responses to questions/suggestions from TAC is attached (Appendix-1)

PLAGIARISM CHECK

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AIMS OF THE STUDY 1. To assess the long term survival in patients undergoing open repair of elective abdominal aortic aneurysms. 2. To assess re-interventions on long term follow up. 3. To assess the perioperative mortality and morbidity in patients undergoing elective abdominal aortic aneurysm repair.

MATERIALS AND METHODS Over a period of 8 years from January 2008 to August 2016, 165 patients who underwent conventional open repair for elective abdominal aortic aneurysms were included in the retrospective analysis to look for early and long term outcomes, survival, complications and reinterventions in this cohort. We also studied the factors which influence the outcome and reinterventions in this group of patients.

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OBSERVATION SHEET

CASE No.

AGE:

SEX :

DIAGNOSIS:

COMMON ILIAC ARTERY STATUS: NORMAL/ANEURYSMAL

COMORBIDITIES:

SMOKING:
ACTIVE:
REFORMED:

COPD:

HYPERTENSION:

DIABETES :

CORONARY ARTERY DS:

RENAL FUNCTION:
PEROP:
PERIOP:
DELAYED:

NECK VESSEL DOPPLER:

POVD:

OTHER COMORBIDITIES:

PROCEDURE:
DATE OF SX:
PROCEDURE:
RENAL VEIN DIVISION:

IMMEDIATE POSTOP COMPLICATIONS:
REEXPLORATIONS:

PERIOP COMPLICATIONS:

WOUND RELATED:

GRAFT RELATED:

REEXPLORATIONS:

DATE OF DISCHARGE:
DURATION OF HOSPITAL STAY:

LONG TERM COMPLICATIONS:(BEYOND 30 DAYS)

DATE OF READMISSIONS: REASONS:

REINTERVENTIONS:

DATE: DIAGNOSIS: PROCEDURE DONE:

FOLLOW - UP:
DURATION:
DATE OF LAST VISIT &EVALUATION:

LONG TERM SURVIVAL:

COMMENTS (IF ANY):

(SIGNATURE OF INVESTIGATOR)

LIST OF ABBREVIATIONS

AAA - ABDOMINAL AORTIC ANEURYSM

DM - DIABETES MELLITUS

HTN - HYPERTENSION

COPD - CHRONIC OBSTRUCTIVE PULMONARY DISEASE

CAG - CORONARY ANGIOCRAM

CT - COMPUTERISED TOMOGRAPHY

MRI - MAGNETIC RESONANCE IMAGING

CT-CAG - COMPUTERISED TOMOGRAPHY - CORONARY ANGIOGRAM

EVAR - ENDOVASCULAR ANEURYSM REPAIR

EVAR -1 TRIAL - ENDOVASCULAR VS OPEN REPAIR FOR AAA

DREAM TRIAL - DUTCH RANDOMISED ENDOVASCULAR ANEURYSM MANAGEMENT

OVER TRIAL - OPEN VERSUS ENDOVASCULAR REPAIR TRIAL

ACE TRIAL - ANEZRYSME DE LAORTE ABDOMINALE, CHIRURGIE VERSUS ENDOPROTHESE TRIAL

ABPI - ANKLE BRACHIAL PRESSURE INDEX

MASTER CHART

SL	IPNUMBER	DIAGNOSIS	AGE	SIZE	Durationoffollowup	SEX	INFRARENALORJUXTARENAL	SMOKING	COPD	HTN	DM	NVD	CORONARYARTERYDS	PREOPPCI	POVD	GRAFTTYPE	LRV	CIAA	DVTPOSTOP	ABDWALLDEHISCENCE	PERIOPWOUNDINFECTION	PERIOPCOMPRESPIRATORY	REEXPLORATIONBLEEEDING	PERIOPRENALDYSFN	PERIOPHD	MI	EARLYMORTA	LONGTERMMORTALITY	Mortality	WOUNDRELATED	GRAFTRELATED	Agec2	DurationFlp
1.0	275707.0	IRAAA	67.0	5.6	95	1	1.0	1	2	1	0	0	4	0	0	1	1	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2
2.0	273677.0	IRAAA	61.0	6.2	49	1	1.0	2	1	1	0	0	1	1	0	1	1	0	2	2	2	2	2	2	2	2	2	2	2	2	1	2
3.0	276083.0	IRAAA+CIAA	66.0	5.9	25	1	1.0	2	1	1	0	0	2	0	0	2	1	1	2	2	2	2	2	2	2	2	2	2	2	1	2	1
4.0	276452.0	IRAAA	68.0	7.0	50	1	1.0	2	1	1	0	0	3	1	0	1	1	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2
5.0	278209.0	JRAAA	79.0	6.0	18	1	2.0	2	1	1	0	0	4	0	0	1	1	0	2	2	2	2	2	2	2	2	2	2	2	2	2	1
6.0	279814.0	IRAAA	70.0	5.4	8	1	1.0	0	1	0	0	0	4	0	0	1	1	0	2	2	2	2	2	2	2	2	2	2	2	2	2	1
7.0	282772.0	IRAAA	67.0	4.9	72	1	1.0	2	1	1	0	1	2	0	1	1	1	0	2	2	2	2	2	2	2	2	2	1	1	2	2	2
8.0	280730.0	IRAAA+ Left CIAA	50.0	5.5	1	1	1.0	1	1	1	0	0	4	0	0	2	1	1	2	2	2	2	2	2	2	2	2	2	2	2	1	1
9.0	285295.0	IRAAA	56.0	5.3	95	1	1.0	1	1	0	0	0	2	0	1	2	1	0	2	2	2	1	1	1	2	2	2	2	2	2	1	2
10.0	286704.0	IRAAA	70.0	6.0	54	1	1.0	0	1	1	1	0	2	0	0	1	1	0	2	2	2	2	2	1	2	2	2	2	2	2	2	2
11.0	287108.0	JRAAA	52.0	6.2	47	1	2.0	2	1	1	0	0	4	0	0	1	3	0	2	2	2	2	2	2	2	2	2	2	2	2	1	2
12.0	288419.0	IRAAA+ B/L CIAA	62.0	5.8	34	1	1.0	0	1	0	0	0	2	0	1	2	1	1	2	1	2	2	2	2	2	2	2	2	2	1	2	1	1
13.0	299876.0	IRAAA	60.0	5.2	82	1	1.0	1	1	1	0	0	2	0	0	1	1	0	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2
14.0	2345678.0	IR	36.0	6.0	91	1	1.0	2	1	1	0	3	4	0	0	1	1	0	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2
15.0	291206.0	IRAAA-	76.0	5.9	89	1	1.0	2	1	1	0	0	3	1	0	1	1	0	2	2	2	2	2	1	2	2	2	2	2	2	2	2	2
16.0	292754.0	IR	62.0	5.2	88	1	1.0	1	1	0	0	0	3	0	0	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2
17.0	292832.0	IRAA	65.0	5.4	60	1	1.0	1	1	1	0	0	4	0	0	1	1	0	2	2	2	2	2	2	2	2	2	1	1	2	2	2	2
18.0	294229.0	IR 6.9, RIGHT CIA	73.0	6.9	93	1	1.0	1	1	1	1	2	3	0	0	2	1	0	2	1	1	2	2	2	2	2	2	2	2	2	1	2	2
19.0	295510.0	IRAAA	68.0	7.0	91	1	1.0	1	1	1	0	0	1	0	0	1	1	0	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2
20.0	293223.0	IR 6CM	72.0	6.0	84	1	1.0	2	1	1	0	0	3	1	0	1	1	0	2	2	2	2	2	2	2	2	2	2	2	1	2	2	2
21.0	273261.0	IRAAA 6.2	66.0	6.2	0	1	1.0	2	1	0	0	0	3	1	0	1	1	0	2	2	2	1	2	1	2	2	1	2	1	2	2	2	1
22.0	281004.0	JRAAA- 6.2CM	58.0	6.2	77	1	2.0	1	1	1	0	2	1	1	1	1	2	0	2	2	2	2	2	1	2	2	2	1	1	2	2	1	2
23.0	297666.0	IRAAA 6.5	60.0	6.5	79	1	1.0	2	1	1	0	0	0	0	0	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2
24.0	298908.0	IR 8CM	56.0	8.0	85	1	1.0	1	1	1	0	0	0	0	0	2	1	0	2	2	2	2	1	2	2	2	2	2	2	2	2	1	2
25.0	281392.0	IRAAA - 5.2	83.0	5.2	86	1	1.0	2	1	1	0	2	0	0	0	1	1	0	2	2	2	2	2	2	2	2	2	1	1	2	2	2	2
26.0	287908.0	IRAAA 6.7	70.0	6.2	75	1	1.0	1	1	1	0	0	0	0	0	1	1	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
27.0	304338.0	JRAAA SACCULAR,	65.0	5.8	81	1	2.0	2	1	1	0	3	2	1	0	2	2	0	2	1	1	2	2	2	2	2	2	2	2	2	2	2	2
28.0	304361.0	IRAAA + BIL CIAA 6.5	56.0	6.5	67	1	1.0	2	1	1	0	0	4	0	2	2	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2
29.0	305256.0	IRAAA 5.6CM	69.0	5.6	78	1	1.0	2	1	1	1	0	1	0	0	1	1	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
30.0	306770.0	IRAAA 6CM	62.0	6.0	66	1	1.0	1	2	1	0	0	3	1	0	2	1	1	2	2	2	2	2	2	2	2	2	1	1	2	1	1	2
31.0	308644.0	IRAAA9.8, DTAA4.3	68.0	9.8	71	1	1.0	1	1	1	0	0	0	0	0	1	1	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
32.0	310675.0	JRAAA6CM, RCIAA 8CM	72.0	6.0	70	1	2.0	1	1	1	0	0	4	0	0	2	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
33.0	306911.0	JRAAA 12CM	67.0	12.0	0	1	2.0	0	1	1	0	0	3	1	0	2	2	1	2	1	1	2	2	1	1	2	1	2	1	2	1	2	1
34.0	313421.0	JRAAA 8CM	63.0	8.0	78	1	2.0	2	1	1	0	0	3	0	0	1	1	0	2	1	1	2	2	2	2	2	2	2	2	1	2	1	2
35.0	269219.0	IRAAA 5.5	61.0	5.5	54	1	1.0	2	1	1	1	0	0	0	0	1	1	0	2	2	2	2	1	2	2	2	2	2	2	2	2	1	2
36.0	313998.0	IRAAA 4.8CM	65.0	4.8	79	2	1.0	0	1	1	0	0	0	0	0	1	1	0	2	1	2	2	2	2	2	2	2	2	1	2	2	2

37.0	314014.0	IRAAA	64.0	4.9	77	1	1.0	2	1	1	0	0	1	0	0	1	1	0	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2
38.0	306054.0	IRAAA 8CM	63.0	8.0	65	1	1.0	2	1	1	0	0	3	1	0	1	4	0	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2
39.0	314725.0	IRAAA 7.2CM, BIL CIAA 1	65.0	7.2	65	1	1.0	1	1	1	1	2	2	0	0	2	1	1	2	2	2	2	2	2	2	2	2	2	2	2	1	2	2
40.0	295287.0	IRAAA	69.0	9.0	64	1	1.0	1	1	1	0	0	0	0	0	1	1	1	2	2	2	2	2	1	2	2	2	2	2	2	2	2	2
41.0	318882.0	IRAAA+ B/L IIAA	45.0	7.5	74	2	1.0	2	1	0	0	0	0	0	0	1	1	0	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2
42.0	319627.0	IRAAA 5.4CM	64.0	5.4	72	1	1.0	2	1	1	0	0	0	0	0	1	1	0	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2
43.0	315916.0	IRAAA 7.2	67.0	7.2	65	1	1.0	2	1	1	0	1	0	0	0	1	1	0	2	2	2	2	2	2	2	2	2	2	2	1	2	2	2
44.0	319579.0	IRAAA 6.4CM	61.0	6.4	66	1	1.0	2	1	1	0	1	2	1	0	1	1	0	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2
45.0	321235.0	IRAAA,	75.0	5.6	63	1	1.0	2	1	1	0	2	0	0	1	1	1	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
46.0	321935.0	IRAAA,	66.0	6.7	62	1	1.0	2	1	1	0	0	0	0	0	2	1	0	2	2	2	2	2	2	2	2	2	1	1	2	1	2	2
47.0	322293.0	IRAAA,	53.0	7.8	59	1	1.0	2	1	1	0	2	0	0	0	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2
48.0	322294.0	IRAAA,	65.0	8.9	59	1	1.0	2	1	1	0	0	1	0	0	1	1	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
49.0	323824.0	IRAAA, 6CM, AEF, HEMET	62.0	6.0	34	1	1.0	2	1	1	0	0	4	0	0	1	1	0	2	2	2	2	2	1	2	2	2	1	1	2	2	1	1
50.0	323266.0	JRAAA,	62.0	7.5	58	1	2.0	2	1	1	0	0	2	0	0	1	2	0	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2
51.0	322458.0	IRAAA	65.0	5.8	58	1	1.0	1	2	1	0	0	4	0	0	1	1	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
52.0	328486.0	IRAAA, RT CIAA	63.0	5.7	43	1	1.0	2	1	1	0	0	0	0	0	2	1	1	2	2	2	2	2	2	2	1	2	2	2	2	2	1	2
53.0	329083.0	IRAAA, SADDLE THROMB	55.0	7.7	0	1	1.0	1	1	1	0	0	1	0	1	2	1	0	2	2	2	2	2	2	2	2	1	2	1	2	2	1	1
54.0	327487.0	iraaa, SEPSIS, NOT OPERA	65.0	8.0	55	1	1.0	2	1	1	0	0	4	0	0	1	1	0	2	2	2	2	1	2	2	2	2	2	2	2	2	2	2
55.0	329218.0	IRAAA	55.0	7.5	55	1	1.0	2	1	1	0	1	3	1	0	2	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2
56.0	324510.0	TA, IRAAA, LRA CTO, R RA	26.0	7.0	55	2	1.0	0	1	1	0	0	0	0	0	2	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2
57.0	330549.0	JRAAA, BIL CIAA	35.0	6.8	30	1	2.0	0	1	1	1	0	0	0	0	2	2	1	2	2	1	2	2	2	2	2	2	1	1	1	1	1	1
58.0	331263.0	JRAAA, BIL CIAA, 14CM	65.0	14.0	29	1	2.0	0	1	1	0	0	0	0	0	2	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1
59.0	332380.0	JRAAA,	69.0	10.0	53	1	2.0	1	1	1	0	2	1	0	0	1	1	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
60.0	309989.0	IRAAA,	65.0	9.5	51	1	1.0	2	1	1	0	1	3	1	0	1	1	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
61.0	334956.0	SACCULAR IRAAA	75.0	4.5	14	1	1.0	2	1	1	0	1	1	0	0	1	2	0	2	2	2	2	2	1	2	2	2	2	2	2	2	2	1
62.0	335103.0	IRAAA	75.0	5.0	14	1	1.0	0	1	1	0	0	0	0	0	1	1	0	2	2	2	1	2	2	2	2	2	2	2	2	2	2	1
63.0	335331.0	IRAAA	57.0	5.4	51	1	1.0	1	1	1	0	2	1	0	0	2	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2
64.0	335840.0	IRAAA	74.0	4.9	49	1	1.0	0	1	1	0	0	1	1	0	1	1	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
65.0	335324.0	IRAAA 6CM	62.0	6.0	49	1	1.0	1	1	1	0	1	0	0	0	1	1	0	2	2	2	2	2	2	2	2	2	1	1	2	2	1	2
66.0	335547.0	IRAAA 7CM	64.0	7.0	50	1	1.0	1	1	1	0	1	1	0	0	1	1	0	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2
67.0	336345.0	JRAAA 7.6	73.0	7.6	50	1	2.0	1	1	1	0	0	0	0	0	1	2	0	2	2	2	2	1	1	2	2	2	2	2	2	2	2	2
68.0	336736.0	IRAAA 13CM	82.0	13.0	50	1	1.0	2	1	1	0	0	4	0	0	1	1	0	2	2	2	2	2	1	2	2	2	2	2	2	2	2	2
69.0	335670.0	IRAAA, RT POP AR AN	61.0	5.6	60	1	1.0	1	1	1	0	0	2	0	1	1	1	0	2	2	2	2	2	1	2	2	2	2	2	1	2	1	2
70.0	210808.0	JRAAA	50.0	4.9	60	1	2.0	2	1	1	0	0	1	1	0	1	2	0	2	2	2	1	2	1	2	2	2	2	2	1	2	1	2
71.0	339093.0	IRAAA 7CM	70.0		53	1	1.0	1	1	1	1	2	0	0	0	2	1	1	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2
72.0	338643.0	IRAAA5.6	65.0	7.0	53	2	1.0	0	1	1	0	0	0	0	0	1	1	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
73.0	340783.0	IRAAA, RT CIAA	72.0	5.6	47	1	1.0	2	1	1	0	0	0	0	0	2	1	1	2	2	2	2	2	2	2	2	2	1	1	2	2	2	2
74.0	341655.0	JRAAA 7.4	77.0	7.4	51	1	2.0	2	1	1	0	0	1	0	1	2	1	1	2	2	2	1	2	1	2	2	2	2	2	2	2	2	2
75.0	344732.0	IRAAA 5.8	76.0	5.8	55	1	1.0	2	1	1	1	0	4	0	0	2	1	1	2	2	2	2	2	1	2	2	2	2	2	2	2	2	2
76.0	345314.0	IRAAA6.8	55.0	6.8	55	1	1.0	2	1	1	0	3	3	1	0	1	1	0	2	2	2	2	1	1	2	1	2	2	2	2	2	1	2
77.0	346052.0	IRAAA 6.5CM	73.0	6.5	43	1	1.0	1	1	1	0	0	2	0	0	1	1	0	2	2	2	2	2	1	1	2	2	2	2	2	2	2	2
78.0	346264.0	IRAAA 6.2	67.0	6.2	31	1	1.0	2	1	1	0	0	1	0	0	1	1	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1
79.0	347329.0	IRAAA 7CM	78.0	7.0	40	1	1.0	1	1	1	0	1	1	0	0	1	1	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
80.0	349705.0	IRAAA 5CM	74.0	5.0	56	1	1.0	1	1	1	0	2	1	0	1	1	1	0	2	2	2	1	2	2	2	2	2	2	2	1	2	2	2
81.0	342160.0	IRAAA 7.4	67.0	7.4	52	1	1.0	2	1	1	0	0	3	1	0	1	1	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
82.0	349422.0	IRAAA 12CM	21.0	12.0	45	2	1.0	2	1	1	0	0	0	0	0	2	1	0	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2

83.0	351807.0	IRAAA 12CM	72.0	12.0	38	1	1.0	2	1	1	0	0	0	0	0	1	1	0	2	2	2	2	2	1	2	2	2	2	2	2	2	2	2
84.0	352404.0	IRAAA 5.6	70.0	5.6	44	1	1.0	0	1	1	0	0	1	0	0	1	1	0	2	2	2	2	2	1	2	2	2	2	2	2	2	2	2
85.0	345934.0	IRAAA 5.3	65.0	5.3	40	1	1.0	2	1	1	1	0	1	1	0	1	1	0	2	2	2	1	2	1	1	2	2	2	2	2	2	2	2
86.0	355235.0	IRAAA 6.5	48.0	6.5	42	1	1.0	2	1	1	0	0	0	0	0	1	1	0	2	2	2	2	2	1	2	2	2	2	2	2	2	1	2
87.0	357903.0	IRAAA 4.5	59.0	4.5	42	1	1.0	2	1	1	0	0	1	0	0	1	1	0	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2
88.0	358585.0	IRAAA6, AEF ++	65.0	6.0	42	2	1.0	0	2	1	0	0	0	0	0	1	1	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
89.0	358249.0	IRAAA 6.4	67.0	6.4	41	1	1.0	1	1	1	1	2	2	0	0	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
90.0	357764.0	JRAAA 6	60.0	6.0	33	1	2.0	2	1	1	0	0	1	0	0	1	2	0	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1
91.0	359782.0	IRAAA8.5	82.0	8.5	35	1	1.0	1	1	1	0	1	2	0	1	1	2	0	2	2	2	2	2	1	2	2	2	2	2	2	2	2	1
92.0	360574.0	IRAAA 5.2	79.0	5.2	44	1	1.0	2	1	1	0	0	1	0	0	2	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
93.0	361734.0	IRAAA 10,BIL CIAA	75.0	10.0	34	1	1.0	2	1	1	0	0	1	0	0	2	1	1	2	2	1	2	2	1	2	2	2	2	2	2	2	2	1
94.0	336472.0	IRAAA 6.2	67.0	6.2	33	1	1.0	2	1	1	0	0	1	1	0	1	1	0	2	2	2	2	2	2	2	2	2	1	1	2	2	2	1
95.0	280126.0	IRAAA 7CM	77.0	7.0	30	1	1.0	2	1	1	0	0	2	1	0	1	2	1	2	2	2	2	2	1	2	2	2	2	2	2	2	2	1
96.0	362637.0	IRAAA6CM, RT CIA,IIA AN	62.0	6.0	32	1	1.0	1	1	1	0	0	0	0	0	2	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1
97.0	316326.0	IRAAA6CM	73.0	6.0	40	1	1.0	2	1	1	0	0	3	0	1	1	1	0	2	2	2	2	2	1	2	2	2	2	2	2	2	2	2
98.0	367392.0	IRAAA6CM	65.0	6.0	30	1	1.0	2	1	1	0	1	4	0	0	1	1	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1
99.0	331936.0	IRAAA 7CM	54.0	7.0	29	1	1.0	2	1	1	0	0	4	0	0	1	1	0	2	2	2	2	2	1	2	2	2	2	2	2	1	1	1
100.0	365498.0	IRAAA THROMBOSED	63.0	6.8	28	1	1.0	2	1	1	0	0	1	0	2	2	1	0	2	2	2	2	2	1	2	2	2	2	2	2	2	1	1
101.0	370481.0	IRAAA 6.5	81.0	6.5	1	1	1.0	1	2	1	0	0	1	0	0	1	1	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1
102.0	371004.0	JRAAA7.7	64.0	7.7	28	1	2.0	1	1	1	0	0	4	0	0	1	2	0	2	2	2	2	2	1	2	2	2	2	2	2	2	1	1
103.0	371151.0	IRAAA 12CM	65.0	12.0	28	1	1.0	1	1	1	0	0	1	0	0	1	1	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1
104.0	370588.0	JRAAA, RT CIAA, LT IIAA 7	77.0	7.7	36	2	2.0	0	1	1	1	0	0	0	0	2	1	1	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2
105.0	371815.0	JRAAA, RT CIAA	69.0	7.0	1	1	2.0	2	1	1	0	0	1	1	1	2	2	1	2	2	2	2	1	1	1	1	1	2	1	2	2	2	1
106.0	371647.0	IRAAA 5.3	68.0	5.3	27	1	1.0	2	1	1	0	0	1	0	0	2	1	1	2	2	2	2	2	1	2	2	2	2	2	2	2	2	1
107.0	373004.0	IRAAA, RT CIAA	72.0	5.0	35	1	1.0	1	1	1	0	0	1	1	0	2	1	1	2	2	2	2	2	1	2	2	2	2	2	2	2	2	2
108.0	366352.0	JRAAA, RT CIAA, RT ECTO	46.0	6.0	35	2	2.0	0	1	1	0	0	0	0	0	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2
109.0	372671.0	IRAAA	75.0	7.2	26	1	1.0	2	1	1	0	0	1	0	0	2	1	0	2	2	2	2	2	1	2	2	2	2	2	2	2	2	1
110.0	371670.0	IRAA, BIL CIAA 8CM	68.0	8.0	35	1	1.0	2	1	1	0	0	2	0	0	2	1	1	2	2	1	2	2	2	2	2	2	2	2	2	2	2	1
111.0	375073.0	IRAAA, 5.8CM	72.0	5.8	22	1	1.0	1	1	1	0	0	4	0	0	1	1	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1
112.0	369356.0	IRAAA, 6CM, BIL CIAA	63.0	6.0	21	2	1.0	2	1	1	1	1	1	1	1	2	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1
113.0	372145.0	IRAAA 6.4,	60.0	6.4	23	1	1.0	2	1	1	0	1	3	1	0	1	1	0	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1
114.0	302468.0	IRAAA 7.8CM	64.0	7.8	20	1	1.0	1	1	1	0	0	4	0	0	1	1	0	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1
115.0	352235.0	JRAAA, 6CM	59.0	6.0	23	1	2.0	2	1	1	0	0	1	0	0	1	2	0	2	2	2	2	2	1	1	2	2	2	2	2	2	1	1
116.0	377969.0	IRAAA 7.8CM	59.0	7.8	32	1	1.0	2	1	1	0	0	3	1	0	2	1	0	2	2	2	2	2	2	2	2	2	1	1	1	2	1	1
117.0	377015.0	IRAAA 8CM WITH CH ME	51.0	8.0	23	1	1.0	1	1	1	1	0	2	0	1	1	2	0	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1
118.0	379295.0	JRAAA 9.5CM,BIL CIAA	68.0	9.5	31	1	2.0	1	1	1	0	0	1	0	0	2	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1
119.0	380524.0	IRAAA 9.3	50.0	9.3	21	2	1.0	0	1	1	0	1	1	0	1	2	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1
120.0	382371.0	IRAAA 6.5CM	62.0	6.5	20	1	1.0	1	1	1	0	0	1	1	0	1	1	0	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1
121.0	382816.0	IRAAA, 5.8CM	52.0	5.8	32	1	1.0	2	1	1	0	0	3	1	0	1	1	0	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1
122.0	385670.0	IRAAA 6.5CM	72.0	6.5	27	1	1.0	1	1	1	0	0	4	0	0	1	1	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1
123.0	301453.0	IRAAA, RCIAA, 5.8CM	70.0	5.8	31	1	1.0	2	1	1	0	0	2	0	0	2	1	1	2	2	1	2	2	2	2	2	2	2	2	2	1	2	1
124.0	386733.0	JRAAA, 8.2	64.0	8.2	22	1	2.0	2	1	1	0	0	0	0	0	2	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1
125.0	272603.0	IRAAA, 5.0	69.0	5.0	30	2	1.0	0	1	1	1	0	3	1	0	1	1	0	2	2	2	2	2	1	2	2	2	2	2	2	2	2	1
126.0	381813.0	IRAAA 7CM	74.0	7.0	29	1	1.0	2	1	1	0	0	1	1	0	1	1	0	2	2	2	2	2	1	1	1	2	2	2	2	2	2	1
127.0	387916.0	IRAAA, 5.3	56.0	5.3	21	1	1.0	2	1	1	0	0	4	0	0	2	1	0	2	2	2	2	2	1	2	2	2	2	2	2	2	1	1
128.0	387673.0	IRAAA 5.3	73.0	5.3	21	1	1.0	1	1	1	0	0	1	0	0	1	1	0	2	2	2	2	2	1	2	2	2	2	2	2	2	2	1

129.0	388574.0	IRAAA, 6CM, RT CIAA	75.0	6.0	28	1	1.0	1	1	1	0	0	0	0	0	2	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1
130.0	386506.0	IRAAA, 4.9CM,	62.0	4.9	19	1	1.0	2	1	1	0	0	1	0	0	1	1	1	2	2	2	2	2	1	2	2	2	2	2	1	2	1	1	
131.0	391003.0	IRAAA, 9.2CM	73.0	9.2	27	1	1.0	2	1	1	0	0	1	1	1	2	1	0	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1
132.0	354344.0	IRAAA ATYPICAL, LT CIAA	63.0	5.9	18	1	1.0	2	1	1	1	1	2	1	1	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1
133.0	391567.0	IRAAA 4CM, RT CIAA 7CM	60.0	7.0	26	1	1.0	2	1	1	0	1	4	0	0	2	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1
134.0	392973.0	IRAAA8CM, LT CIAA 3CM	78.0	8.0	16	1	1.0	2	1	1	0	0	4	0	0	2	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1
135.0	394470.0	IRAAA 6CM ,RT CIAA	70.0	6.0	20	1	1.0	2	1	1	0	0	4	0	0	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1
136.0	395054.0	JRAAA	70.0	10.0	15	1	2.0	0	1	1	0	0	4	0	0	1	1	0	2	2	2	1	1	2	2	2	2	2	2	2	2	2	2	1
137.0	380093.0	IRAAA, 5CM	57.0	5.0	23	1	1.0	1	1	1	0	0	4	0	1	1	1	0	2	2	2	2	2	2	2	1	2	2	2	2	2	1	1	
138.0	396418.0	IRAAA, 8CM, RT CIAA	61.0	8.0	14	1	1.0	2	1	1	0	0	0	0	0	2	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1
139.0	398383.0	IRAAA, 5.2	65.0	5.2	6	1	1.0	2	1	1	0	0	2	0	0	1	1	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1
140.0	399018.0	IRAAA, 6.1, RT CIAA 22M	78.0	6.1	14	1	1.0	1	1	1	1	0	0	0	0	2	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1
141.0	403145.0	JRAAA, 6CMtasc d bil iliac	55.0	6.0	14	1	2.0	2	1	1	0	1	4	0	2	2	2	1	2	2	2	2	2	1	2	2	2	2	2	2	2	1	1	
142.0	402772.0	IRAAA, 6CM	74.0	6.0	8	1	1.0	2	1	1	0	0	0	0	0	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1
143.0	293308.0	IRAAA 6.7	66.0	6.7	15	1	1.0	2	1	1	0	0	0	0	0	1	1	0	2	2	2	2	2	1	2	2	2	2	2	2	2	2	2	1
144.0	408981.0	JRAAA, 5.8CM	63.0	5.8	6	1	2.0	1	2	1	0	0	1	0	0	1	2	0	2	2	2	2	2	1	2	2	2	2	2	2	2	1	1	
145.0	410730.0	JRAAA, 7CM	80.0	7.0	6	1	2.0	1	1	1	0	0	0	0	0	2	2	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1
146.0	409252.0	IRAAA 6CM	63.0	6.0	11	1	1.0	2	1	1	0	0	1	0	0	1	1	0	2	2	2	2	2	2	2	2	2	2	2	1	2	1	1	
147.0	411712.0	JRAAA 8CM	47.0	8.0	11	1	2.0	0	1	1	1	0	4	0	0	2	2	0	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	
148.0	411099.0	IRAAA 7CM	53.0	7.0	11	1	1.0	1	1	1	0	0	0	0	0	1	1	0	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	
149.0	267986.0	IRAAA, 8CM	73.0	8.0	4	1	1.0	2	1	1	0	0	1	0	0	2	1	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	
150.0	414263.0	IRAAA 5CM ATYPI DISSTC	61.0	5.0	3	1	1.0	1	1	1	0	0	2	0	0	1	1	0	2	2	2	2	1	2	2	2	2	2	2	2	2	1	1	
151.0	414193.0	IRAAA7CM, BIL CIAA	65.0	7.0	3	1	1.0	1	1	1	0	0	0	0	0	2	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1
152.0	293199.0	IRAAA 6.5CM	67.0	6.5	10	1	1.0	0	1	1	0	0	2	0	0	1	1	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1
153.0	327331.0	IRAAA 6CM, RT CIAA, RT	73.0	6.0	3	1	1.0	2	1	1	0	0	1	0	0	2	1	1	2	2	2	2	2	1	2	2	2	2	2	2	2	2	1	
154.0	415901.0	JRAAA 10CM	61.0	10.0	2	1	2.0	1	1	1	0	0	1	0	0	1	2	0	2	2	2	2	2	1	2	2	2	2	2	2	2	1	1	
155.0	415893.0	IRAAA, LUMBAR VERTEBI	72.0	7.0	2	1	1.0	2	1	1	0	0	0	0	0	1	1	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1
156.0	394275.0	IRAAA 7CM, SMALL DTAA	60.0	7.0	1	1	1.0	2	1	1	1	0	0	0	0	1	1	0	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	
157.0	417804.0	IRAAA 7CM	67.0	7.0	5	1	1.0	0	1	1	0	0	4	0	0	1	2	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	
158.0	418365.0	IRAAA 8.5, BIL CIAA	63.0	8.5	5	1	1.0	1	1	1	0	0	0	0	0	2	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	
159.0	417927.0	IRAAA,5.9 CM	81.0	5.9	4	2	1.0	0	1	1	1	0	4	0	0	2	1	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	1
160.0	418483.0	JRAAA 7CM, RT CIA OCLU	66.0	7.0	3	1	2.0	1	1	1	0	0	1	1	0	2	2	1	2	2	2	1	2	1	2	2	2	2	2	2	2	2	1	
161.0	421740.0	IRAAA 6CM,	72.0	6.0	2	1	1.0	2	1	1	0	0	0	0	0	1	4	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1
162.0	422928.0	IRAAA, 10.5	61.0	10.5	5	1	1.0	1	2	1	0	0	4	0	0	1	1	0	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	
163.0	419931.0	IRAAA 4CM, BIL CIAA 5M	76.0	4.0	5	1	1.0	2	1	1	0	0	0	0	0	2	1	1	2	2	1	2	2	2	2	2	2	2	2	2	1	2	1	
164.0	423198.0	IRAAA 7CM	57.0	7.0	5	1	1.0	2	1	1	0	0	1	0	0	1	1	0	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	
165.0	424651.0	IRAAA 8CM	64.0	8.0	4	1	1.0	1	1	1	0	0	2	0	0	1	1	0	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	