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### #LIVE2024

**BOOK OF ABSTRACTS** 

#### SHOCKWAVE INTRAVASCULAR LITHOTRIPSY IN THE MANAGEMENT OF HOSTILE ILIAC ACCESS DURING ENDOVACULAR AORTIC REPAIR

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**Background:** The application of endovascular therapies in the treatment of aortic pathologies is gaining increasing popularity. However, a major limitation of current endovascular devices are large bore sheaths in combination with calcified access vessels. Although iliac artery calcification may not always result in stenosis, calcification can contribute to the loss of elasticity and compliance. In contrast to conventional angioplasty, Shockwave intravascular lithotripsy (IVL; Shockwave Medical) uses ultrasonic waves to induce micro-fracturing in calcified plaque. IVL allows for enhanced vessel compliance by fracturing calcifications of both intimal and medial layers without injuring the vessel.

<u>Aim</u>: To report the use of Shockwave Intravascular Lithotripsy (IVL) in the management of hostile iliac access during endovacular aortic repair.

**Methods:** All patients who underwent endovascular aortic repair for infrarenal, pararenal or thoracoabdominal aneurysm with hostile access vessels (circumferential calcifications extended to more than 50% of the vessel length, hemodynamic stenosis, or occlusions) were included in the present study. Pre-, intra-, and postoperative data were collected and retrospectively analyzed. Technical success, early complications, reinterventions and mortality were recorded.

**<u>Results</u>:** From January 2023 to March 2024, 233 patients underwent endovascular aneurysm aortic repair at our department. Thirteen patients (5.6%) had hostile iliac access, where IVL was used. Technical success was achieved in all cases; there were no cases of dissection, peripheral embolization or vessel rupture. During the follow-up period, no case of restenosis or limb occlusion was recorded.

**Conclusions:** Our experience shows that IVL in hostile iliac access during endovacular aneurysm aortic repair is safe and effective. The IVL system is an additional tool in the vascular surgeon's armamentarium to obtain large-bore access in hostile access vessels. Further studies are needed to better assess the clinical effectiveness of the IVL system.

#### DURABILITY OF A SECOND-GENERATION BALLOON-EXPANDABLE COVERED STENTGRAFT IN PATIENTS TREATED WITH FENESTRATED, BRANCHED AND CHIMNEY ENDOVASCULAR AORTIC ANEURYSM REPAIR

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**Background - Aim:** Covered stent-grafts constitute an essential component of fenestrated (fEVAR), branched (bEVAR) and chimney (chEVAR) endovascular repair. Target vessel (TV) instability events may lead to technical and clinical failure. We present the mid-term outcomes of the second generation of BeGraft (Bentley InnoMed, Hechingen, Germany) balloon-expandable covered stentgraft (BXCS) as an "off-the-shelf" platform used in complex endovascular repair.

**Methods:** This is a retrospective analysis of prospectively collected data from a single-tertiary center. All consecutive patients treated for juxtarenal, pararenal and thoracoabdominal (TAAA) aortic aneurysms during a 7-year time period (May 2016 - May 2023) either by fEVAR, bEVAR or chEVAR in whom BeGraft BXCS were implanted, were included. Outcomes were defined as primary patency rates for each TV at maximum follow-up and were reported using Kaplan-Meier life tables.

**Results:** Begraft stentgrafts were deployed in 111 patients (males: 95%, age: 70.9  $\pm$  6.1 years old) who underwent complex endovascular repair [chEVAR: 53 (47.7%), fEVAR: 22 (19.8%), bEVAR: 35 (31.5%), f/ bEVAR combination: 1 (0.9%)]. Aneurysm type included 36 (32.4%) juxtarenal, 44 (39.6%) pararenal, 16 (14.4%) type IV TAAA, six (5.4%) type III TAAA and nine (8.1%) type II TAAA. Mean maximum aneurysm diameter was 6.7  $\pm$  1.8cm. A total of 307 BeGrafts were deployed [Celiac Trunk (CT): 47 (15.3%), Superior Mesenteric Artery (SMA): 70 (22.8%), Right Renal Artery (RRA): 95 (30.9%), Left Renal Artery (LRA): 95 (30.9%)] for the revascularization of 286 TV. Mean follow-up was 12.7  $\pm$  12.2 months. The primary patency rate of RRA was 96% (SE: 2.1%), 94% (SE: 2.9%) and 90% (SE: 4.7%) at 6,12 and 24 months, respectively. The primary patency rate of CT was 96% (SE: 3.6%), 86% (SE: 10%) at 6 and 24 months, respectively.

**<u>Conclusions</u>**: Second generation BeGraft platform seems to be an effective and durable device for the revascularization of TV during complex endovascular repair.

#### USE OF DEDICATED INTERNAL ILIAC COMPONENTS FOR THE ENDOVASCULAR TREATMENT OF AORTOILIAC ANEURYSMS INVOLVING THE ILIAC BIFURCATION WITH CO-EXISTING HYPOGASTRIC ANEURYSMS BY THE ILIAC BRANCH ENDOPROSTHESIS IMPROVES THE OUTCOMES (THE HYPROTECT STUDY)

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**Objective:** Co-existence of hypogastic aneurysms (HA) in endovascular repair of iliac aneurysms worsen the outcomes. Aim of the present study was to evaluate the mid-term outcomes of the Gore Excluder Iliac Branch Endoprosthesis (IBE) and dedicated bridging devices in patients with HA in a large contemporary multicentric European experience.

**Methods:** The study included all consecutive patients treated at participating institutions with Gore IBE device who received a covered stent (i.e. stent-graft) from the same manufacturer, including the the Gore VBX balloon-expandable covered stent, and the Gore Excluder IBE internal iliac component or any combination thereof. Outcomes that were assessed during follow-up included overall survival, primary and secondary HA patency, freedom from HA branch instability (composite cumulative endpoint of any HA branch-related complications leading to aneurysm rupture, death, occlusion or stenosis/kink, disconnection, type 1 or 3 endoleak (EL), or reintervention to maintain branch patency or to treat a separation or EL), and failure of sac regression>5mm.

**<u>Results:</u>** A total of 446 patients were included for analysis from 22 European vascular surgery centers. Patients were categorized into two subgroups: subgroup A if they did not have concomitant hypogastric aneurysms (n=269), otherwise they were categorized into subgroup B (n=168). The mean age was 74 (SD:11) years. No significant differences regarding demographics and age were observed between the 2 groups (p=.34). There were significant differences in the selection of bridging stents between study groups, with a lower percentage of those in subgroup A receiving a balloon expandable stent-graft than those in subgroup B (6% vs 22%, p<.001). Cumulative survival rates for the two study groups at two years were 96% and 92% respectively (p=.532). The two-year estimates for freedom of iliac branch instability was higher for patients in group A as compared with patients in group B (94% vs 90%, p=.045). However, the cumulative failure to regress at two years was similar between study groups (3% vs 6%, p=.904). At univariate regression, the number of stent-grafts used was associated with higher risk of iliac branch instability but not of IBE-related reinterventions.

**Conclusions:** This large contemporary European multicentric experience with the use of the Gore IBE and dedicated bridging devices in patients with or without associated HA aneurysms shows comparably satisfactory mid-term outcomes.

#### SINGLE-CENTER EXPERIENCE IN THE SURGICAL TREATMENT OF MYCOTIC ANEURYSMS

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**Methods**: From January 2010 to February 2024, 8 patients (all males, median age 71.37±8.78 years) underwent open surgery for the treatment of mycotic aortic aneurysm. In all cases, the mycotic aneurysm was documented by a combination of clinical findings, laboratory tests, imaging, and microbiologic tests.

**<u>Results</u>**: A total of 7 patients presented with abdominal, while one patient with IV thoracoabdominal aortic aneurysm. Among all patients, 3 were presented with aneurysm rupture, while 5 patients were presented with fever, septicemia and abdominal or lumbar pain. Pathogens involved were methicillin-susceptible Staphylococcus aureus (MSSA; 1 patient), Staphylococcus hominis (1 patient), Klebsiella spp. (2 patients), Mycobacterium tuberculosis (1 patient), Mycobacterium bovis (1 patient) and in 2 patients the pathogen was not isolated. Regarding treatment, 4 patients were treated using bovine pericardium, 3 had Neoaortoiliac System (NAIS) operation, while one patient was treated with endovascular aortic repair (EVAR) and drainage of the aortic sac. A transabdominal approach was used in 6 and retroperitoneal in two patients. In-hospital mortality was 25% (2/8). All patients received long-term antibiotic therapy. During follow-up, 2 patients developed recurrence of infection with gastrointestinal bleeding with aorto-enteric fistula and died after 4 and 10 months.

**<u>Conclusion</u>**: Bovine pericardium and autologous veins may be a valuable option for the treatment of mycotic aneurysm repair.

#### ATHEROSCLEROTIC PLAQUE MORPHOLOGY AND PRIMAL CARDIOVASCULAR EVENTS AFTER CAROTID ENDARTERECTOMY PERFORMED SIMULTANEOUSLY WITH CABG

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**Background and aim of the study:** The incidence of stroke after on-pump cardiac surgery during the perioperative period can affect up to 4% of patients with significant unilateral carotid artery stenosis of 80-99. Between 3% to 10% of individuals who undergo coronary artery bypass grafting (CABG) display notable narrowing of the carotid arteries, which can be improved by either simultaneous or staged carotid endarterectomy and CABG. The aim of the study was to determine the association between the degree of plaque vascularization detected with contrast-enhanced ultrasound and postoperative complications.

**Methods and materials:** A single center retrospective study of 62 patients was performed from 2019 to 2022 who underwent simultaneous CABG/CEA. Exclusion criteria: staged carotid endarterectomy and CABG procedures, off-pump CABG, urgent cases. The focus of our study was on patients who underwent elective CABG. These individuals were diagnosed with coronary artery disease (CAD) and exhibited either asymptomatic internal carotid artery stenosis greater than 70% or symptomatic ipsilateral carotid stenosis exceeding 50%. Before the procedure each patient underwent contrast enhanced ultrasound, the atherosclerotic lesions were classified based on Nakamura et al. classification.

**<u>Results</u>**: Postoperative complications were analyzed within 30 days after surgery and type of plaque morphology detected by contrast-enhanced ultrasound, a statistically significant correlation was found between the presence of a higher grade plaque vascularization and ischemic stroke (r=0.329, p=0.008). Monte Carlo calculations of Chi-square test showed that higher grade of plaque vascularization was significantly associated with peripheral artery disease ( $\chi$ 2=15.175, IIs=2, p=0.003).

**<u>Conclusions</u>:** Ischemic stroke after carotid endarterectomy following CABG within 30 days after surgery has a significant correlation with the presence of a higher grade of plaque vascularization detected by contrast-enhanced ultrasound.

#### ELECTIVE ENDOVASCULAR REPAIR OF INFRARENAL ABDOMINAL AORTIC ANEURYSMS WITH THE MINOS™ ABDOMINAL AORTIC STENT-GRAFT SYSTEM

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**Background - aim:** A variety of endografts are currently available for standard endovascular repair (EVAR) of infrarenal abdominal aortic aneurysms (AAA). The purpose of this study was to report the clinical outcomes of the Minos abdominal aortic stent-graft system, which was recently introduced to the European market.

**Methods:** Between February 2020 and February 2024, we treated 91 consecutive AAA patients (mean age 73.4±8.7 years, 82 males) with elective standard EVAR using the Minos stent-graft. The mean maximum diameter of AAA was 57.7±7.5 mm, the mean proximal neck's (PN) diameter was 24.6±2.8 mm, while the relevant length and angulation were 16.0±7.2 mm and 28.9±10.2°, respectively. Overall, 32 (35.2%) patients presented with shorter and angulated PN, according to the stent-graft's instructions of use. Twenty-four (26.4%) cases were with concomitant significant iliac artery narrowing and tortuosity. Finally, in 39 (42.3%) cases, the distal iliac landing zone was aneurysmatic and were treated with the bell-bottom technique in 35 patients and with limb extension to the external iliac artery in 4 cases. We evaluated the technical and clinical success of the index procedures, which was based on the combination of five factors: freedom from EVAR-related mortality, endograft-related endoleak of any type and endograft migration, as well the absence of notable increase in AAA sac diameter and the patency of bifurcated stent-graft and of access vessels.

**<u>Results</u>**: Primary technical and clinical success of index procedures was 100%. During a median 24-month clinical and 18-month radiological follow-up the clinical success was 98.9%. No rupture or EVAR-related death was documented. No type III endoleak or stent-graft migration was documented. There were 2 (2.19%) type Ib endoleaks that were treated with iliac extension. One (1.1%) limb occlusion was documented and treated accordingly. Total reintervention rate was 3.3%. Eleven (12.1%) type II endoleaks were detected with stable AAA sac diameter. The overall incidence of sac regression >5mm was 34.1%.

**Conclusion:** The results of our series showed that the Minos stent-graft provided excellent feasibility and safety features, even through angulated and tortuous iliac vessels and in short and angulated PN. The overall success at 2 years suggests that the performance of Minos stent-graft follows very high standards. Further validation of these promising results with long-term data is essential to complete the evaluation of this recently introduced stent-graft system.

## DIRECT ISCHEMIC POSTCONDITIONING AFTER EVERSION CAROTID ENDARTERECTOMY - A CONTINUING INVESTIGATION

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**Introduction**: Ischemic reperfusion (IR) injury plays a critical role in adverse neurological outcomes following carotid endarterectomy (CEA). In this context, we continue to investigate a novel surgical technique called ischemic postconditioning (IPCT), which is designed to mitigate the effects of IR injury. The primary objective of our study was to evaluate the effects of the IPCT on neurological outcome in patients with high risk of IR injury after CEA.

**Methods**: This is an observational case-control investigation from December 2015 to December 2023. It involved 728 patients identified as "high-risk reperfusion" candidates, divided equally into two groups: those undergoing IPCT and those who did not receive IPCT. The classification of high risk for IR injury after CEA was based on several criteria, including: severe internal carotid artery (ICA) stenosis (>90%), severe bilateral ICA stenosis (>80%), severe ICA stenosis (>80%) with contralateral ICA occlusion, and severe ICA stenosis with a recent history of transient ischemic attack (TIA) or stroke. The extent of carotid stenosis before CEA was assessed through multidetector CT angiography. The IPCT procedure was implemented by executing six cycles of alternating 30 seconds of reperfusion (achieved by declamping the ICA) and 30 seconds of ischemia (through reclamping the ICA), immediately following the completion of the initial CEA.

**Results:** Cumulative incidence of intrahospital postoperative TIA/stroke was significantly higher in the non-IPCT group when compared to IPCT group 5.7%% vs. 0.6% (OR 0.077; CI 95% 0.010 - 0.616; p ? 0.003). Throughout the follow-up period, there were no reported TIAs, strokes, or neurological mortality in either patient group.

**<u>Conclusion</u>**: In our study IPCT significantly reduced the incidence of postoperative cerebral ischemic events after CEA in patients with high-risk of IR after CEA.

LIVE2024 Oral Presentations

#### **Oral Presentations**

#### **OP01**

#### EFFICACY AND SAFETY OF URGENT CAROTID ENDARTERECTOMY FOR CRESCENDO TRANSIENT ISCHEMIC ATTACK

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**<u>Aim</u>**: The aim of this study was to evaluate the efficacy and safety of urgent carotid endarterectomy (UCEA) compared with elective carotid endarterectomy (ECEA) in the treatment of crescendo transient ischemic attack (cTIA), a rare syndrome characterized by recurrent progressive neurological symptoms.

**Methods:** We conducted a retrospective analysis of 87 patients who underwent UCEA within 6 hours of the onset of cTIA symptoms and compared their results with 8168 patients who underwent ECEA during the same period. Patients were followed for an average of 94 months (early period <30 days, late period >30 days). Outcomes were defined as total mortality, stroke, myocardial infarction (MI), as well as the presence of significant restenosis (>50%).

**Results:** In the early postoperative period, all patients in the UCEA group had an excellent recovery without fatal outcomes. During the late follow-up period, 1.1% in this group had stroke and 2.3% had significant restenosis, for an overall mortality of 3.5%. In the ECEA group, 30-day mortality was 1.3%. At late follow-up, a mortality rate of 2.1% was recorded, as was 4.3% of patients with significant restenosis. No significant differences were found in the characteristics of early and late postoperative complications, neurological and total mortality between the two groups. In patients with cTIA, ulcerated plaque was significantly more common compared to patients in the ECEA group (p=0.001). The ABCD2 score in cTIA patients was found to be  $6.7\pm0.7$ , indicating a high two-day risk of stroke requiring urgent treatment. Perioperative complications in the form of hematoma, peripheral nerve damage, or wound infection were not significantly different between the two groups.

**<u>Conclusion</u>**: UCEA may be a safe and effective treatment for patients with cTIA. The early and long-term outcomes of patients who underwent UCEA for cTIA were comparable to those who underwent ECEA.

#### **ROBOTIC VASCULAR SURGERY**

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**Background - Aim:** Laparoscopic, robotic and endovascular technique represent latest technological procedures in vascular surgery. The aim of this retrospective study was to describe and evaluate our single center experience with robotic aortic and non-aortic vascular surgery to treat mostly occlusive disease and aneurysms.

**Methods:** From November 2005 to August 2023, 615 robot assisted vascular operations were performed. 389 patients were prospectively evaluated for occlusive disease, 163 patients for abdominal aortic aneurysm (AAA), 8 for a common iliac artery aneurysm, 11 for a splenic artery aneurysm, 1 for a internal mammary artery aneurysm, 22 patients for median arcuate ligament release, 15 for endoleak Il treatment post endovascular aneurysm repair (EVAR), 2 for renal artery reconstruction, 1 paraaortic biopsia and 3 cases were inoperable. 6 hybrid procedures in study were performed. 4 patients underwent combined robotic incisional hernia prosthetic mesh repair with robotic vascular procedure and 1 patient with type B dissection and heavy stenosis of the renal artery was treated by robotic ilio-renal bypass and thoracic stent graft implantation.

**<u>Results</u>**: 590 cases (96%) were successfully completed robotically, 3 patient's surgery (0,5%) was discontinued due to heavy aortic calcification and severe peri-aortitis respectively. In 22 patients (3,5%) conversion was necessary. The thirty-day mortality rate was 0,3% (2 patients), and prothesis infection were observed in 2 patients (0,3%).

**Conclusions:** Our experience with robot-assisted laparoscopic surgery has demonstrated the feasibility of this technique for occlusive diseases, aneurysms, endoleak II treatment post EVAR, for median arcuate ligament release and hybrid procedures. The robotic system provides a real opportunity for minimally invasive surgery in the field of vascular surgery and offers true mini-invasive surgical vascular interventions with all its advantages. Robotic AAA treatment and aorto-femoral represent the standard operations in vascular surgery, and they are not only possible but also safe and successful.

#### EXPERIENCE IN ENDOVASCULAR TREATMENT OF ATHEROSCLEROTIC LESIONS OF THE CAROTID ARTERIES OF HIGH-RISK SURGICAL PATIENTS

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**<u>Aim</u>**: To improve the results of treatment of symptomatic patients with hemodynamically significant carotid artery lesions at high surgical risk and to evaluate the effectiveness of carotid stenting.

**Materials and Methods**: Endovascular stenting of 25 carotid arteries was performed in 22 high-risk surgical patients. That included 11 patients with stenosis on one side and occlusion on the contralateral side; 7 patients with bilateral critical stenosis; 4 patients with critical carotid artery stenosis and low ejection fraction; and 1 patient with sub-occlusion with a free-floating thrombus in the ICA. The average age of the patients was  $67.5 \pm 3.4$  years, and all of them had suffered a transient ischemic attack or ischemic stroke in the period from 2 weeks to 1 year. All the patients had comorbidities: 18 - arterial hypertension, 14 - coronary heart disease, of which 4 had an ejection fraction of less than 40%, 3 - diabetes mellitus, 6 - obliterative peripheral vascular disease, 1 - cancer. All surgical repairs were conducted under local anesthesia via femoral artery access. Systemic heparinization with a preoperative loading dose of 300 mg of Clopidogrel was administered. In 21 cases, distal protection was used, and in one - proximal. Open-cell self-expanding stents were chosen together with balloon dilatation catheters (diameter 6 mm) to stretch the areas open.

**<u>Results</u>**: Technical success was achieved in 100% of cases, the average operation time was 75 minutes, in 3 cases there were symptoms of hyperperfusion which were corrected conservatively within 2-3 days. In one case, a hemorrhagic stroke resulted in death during the reporting period.

**Conclusions**: Endovascular stenting of the carotid arteries is a minimally traumatic, effective technique with good early and long-term results in symptomatic patients who are at high surgical risk.

#### EARLY MULTICENTRIC OUTCOMES OF THE ON-LABEL AND CE-MARKED COMBINATION OF THE ENDURANT WITH THE RADIANT CHIMNEY GRAFT FOR THE CHIMNEY ENDOVASCULAR AORTIC REPAIR (ENCHEVAR): THE LAMUR REGISTRY

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**Background:** To evaluate the early results of the CE-marked standardized device combination consisting of Endurant and the Radiant chimney graft (En-ChEVAR) for the treatment of juxtarenal aortic aneurysms.

**Methods:** Multicentric non-industry sponsored case series evaluating the EnChEVAR technique for patients treated between December 2022 and February 2024. Clinical, perioperative procedure-related and radiological data were collected. The primary outcome measure was the freedom of a type Ia gutter-related endoleak at postoperative computed tomography angiography (CTA). Secondary outcome measures included early type Ia endoleak-related reinterventions, target vessel complications including dissection or loss of target vessel, major adverse events, and mortality. Continuous variables were presented as median (interquartile Range-IQR) and categorical variables as count and percentage.

**Results:** Ten patients were included in the present study. 8(80%) were male, in nine cases a single chimney was implanted, and the other one was a double chimney graft placement. The treated aneurysms had an infrarenal neck length of 3.4(1.2) mm. The rate of main body oversizing was 30%. The new neck length after chimney graft placement was 18 (3) mm. The median procedural time was 130(17) mm, contrast medium use was 109(26) ml, radiation time was 45 (12) min.

The technical success was 100%. No type Ia endoleak was detected at the postoperative CTA. There were no target vessel issues. No major adverse events or death were observed.

**Conclusion**: First reported cohort of patients treated with EnChEVAR demonstrated reproducible clinical and procedural outcomes within the 3 vascular centers with total exclusion of the aneurysms, patent renal arteries, and no evidence of gutter-related type IA endoleak. Further evidence with larger sample size of treated patients and longer follow-up are needed.



#### LONG-TERM OUTCOMES OF COMPLEX ABDOMINAL AORTIC ANEURYSMS TREATED USING THE CHIMNEY TECHNIQUE

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**Introduction:** The chimney endovascular aortic repair (ChEVAR) technique is an established endovascular option for complex AAA treatment. We present the long-term outcomes of the ChEVAR technique for the treatment of complex AAA in a single tertiary center.

**Methods:** This is a retrospective analysis of prospectively collected data. All patients undergoing ChE-VAR for juxta-, para-, and supra-renal AAA in a single-tertiary center during an 8-year time-period (March 2016-March 2024) were included. Primary outcomes were overall survival, primary patency of TV and freedom from type Ia endoleak (EL Ia) and were reported using Kaplan-Meier life tables.

**Results:** A total of 74 patients (males: 95.9%, mean age: 72  $\pm$  6.8 years old) underwent single (24.3% -18/74), double (37.8% - 28/74) or triple (35.1% - 26/74) ChEVAR were included. Aneurysm type included 29 juxtarenal (39.1%), 39 pararenal (52.7%), and six suprarenal (8.1%) AAA, while mean aneurysm diameter was 7.1  $\pm$  2cm. A total of 153 TV were implemented, including 60 (39.2%) right renal arteries, 65 (42.4%) left renal arteries, and 28 (18.3%) superior mesenteric arteries. Mean follow-up was 32 months (1-84 months). Overall survival rates at 1, 2, 3 and 5 years was 76.3%, 73.3%, 69.3%, and 47.7%, respectively. Primary TV patency rates at 2 and 5 years was 98.7%, and 92.5%, respectively. Freedom from EL la rates at 1 and 4 years was 96.7%, and 87.5%, respectively. A total of six aneurysm-related reinterventions were carried out: one case of a custom-made device deployment for EL la treatment, three cases of limb extension for EL lb, and two cases of TV relining.

**Conclusion:** ChEVAR technique offers good mid- and long-term outcomes in terms of TV patency and freedom from endoleak type Ia. ChEVAR seems to be effective and durable during the long-term period, while survival rate of those patients might highlight the need for patients' selection.