

Poster section IV. Aortic

AI-Powered Thoracic Aortic Measurements: A Step Toward Standardization

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Background: Interobserver differences in aortic diameter measurements remain a critical challenge, emphasizing the need for standardized assessment methods. Artificial intelligence (AI) has emerged as a potential tool to improve measurement consistency and accuracy. PRAEVAorta (Nurea, Bègles, France) is already CE-marked for the infrarenal aortic segment. **Aims:** This study aimed to extend the algorithm's applicability to thoracic aortic segments and validate its measurements. **Methods:** Eighty consecutive patients undergoing aortic CT angiography at our tertiary vascular center between July 5, 2024, and September 2, 2024, were analyzed. Patients with dissection, non-native aortic segments, stent grafts, ectatic or aneurysmal segments, penetrating aortic ulcers, or aortic ruptures were excluded. Scans had a slice thickness of 1 mm. Three readers with varying experience levels (6 years, 1 year, and none) measured the maximal diameter of the ascending aorta, arch, and descending aorta, using outer-to-outer wall measurements in a plane inclined to the aortic axis. All scans were processed using an offline research-only version of PRAEVAorta 2 (version PRAEVAorta@2 / V1.5). The aneurysm segmentation process included image preprocessing, lumen and thrombus segmentation, centerline generation, and parameter computation. Models were developed in PyTorch, using convolutional neural networks. The maximum transverse diameter was measured in planes perpendicular to the centerline. Descriptive statistical analysis was performed, defining an absolute maximum difference of <5 mm as clinically acceptable. **Results:** A <5 mm difference was observed in 93.5% of ascending aorta cases, 95% of arch cases, and 82.5% of descending aorta cases when comparing mean manual and automated measurements. The software did not provide results in 20 cases on the arch, preventing misleading measurements when uncertain. **Conclusion:** The AI tool demonstrated good diagnostic accuracy, aligning well with manual measurements. While further refinements are needed, it shows promise as a valuable adjunct in clinical practice.

Complex Endovascular Aortic Repair of Mycotic Aortic Aneurysms

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Introduction: Endovascular repair of mycotic aortic aneurysms (MAA) remains controversial due to the risk of infection-related complications. However, open reconstruction of MAAs involving the level of supra-aortic and reno-visceral vessels might be challenging, and associated with high early-mortality rates. This study describes the outcomes of complex endovascular aortic repair of MAA. **Methods:** This single-center retrospective cohort study included consecutive patients with MAA undergoing endovascular aortic repair with fenestrated, branched endovascular aortic repair between 2017.11. and 2024.08. The presence of MAA was considered based on a combination of clinical presentation, laboratory markers, and CTA imaging according to the ESVS criteria. All patients were managed with broad-spectrum antibiotics at presentation. Patient characteristics, operative data, all-cause mortality, early- and long-term complications were registered. **Results:** Twenty-one patients (85% male, 73.3±5 years) were treated with INAA affecting the aortic arch (n=4), pararenal (n=8) or the thoracoabdominal (n=9) aorta. Procedures included in-situ laser fenestrations (n=12), physician-modified endografts (n=2), off-the-shelf branched (n=2), and custom-made devices (n=5). Technical success was 100%, with no target vessel (total n=59, BrCA n=2, LCCA n=3, LSA n=3, CA n=13, SMA n=15, RRA n=12, LRA=11) loss. No in-hospital death and no in-hospital major complication occurred. During a mean follow-up of 34.5±21.5 months one renal branch occlusion was identified accidentally, which was not revascularized, and three cases (13.6%) required relining of the endograft due to type III A and C endoleaks, and renal branch stenosis. Four patients (22%) presented with infection-related complications, which were successfully managed conservatively (n=2), and CT-guided drainage (n=2). Three-year Kaplan-Meier estimate survival was 89.6% (CI 64% - 97%). **Conclusions:** Complex endovascular repair of MAAs was completed with high technical success and excellent side-branch patency. The number of infection-related complications was acceptable and no graft explantation or surgery was required.

Initial experience of physician modified endograft implantation on a bifurcation platform

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Introduction: Physician modified endograft (PMEG) implantation represents a surgical solution with immense potential, offering the opportunity to provide personalized therapy even for acute aortic pathologies. It offers an alternative to custom-made grafts for fenestrated endovascular aortic repair (FEVAR), which typically require 2-3 months of manufacturing. A wide range of devices are being used as a platform for a PMEG repair. We present our early experience with a bifurcation device, the Terumo Treo. **Methods:** A retrospective cohort study was conducted examining all cases since our first case in August 2023, all of which involved the use of the Treo main body. **Results:** A total of 16 patients (12 men, mean age 74.5 ± 6.9 years) underwent PMEG-FEVAR with the Treo device during the study period. We had a relatively high-risk cohort (ASA score 3-4 in 81.3%) and complex anatomy (aneurysm diameter 70.1 ± 11.1 mm, infrarenal short neck in 12 cases [75.0%]). Preoperative endograft modification took an average of 64.0 ± 14.8 minutes. In total, 62 [4-4] renal-mesenteric arteries were targeted, and 59 stents (95.2%) were successfully implanted. The intensive care unit stay was 0.19 ± 0.39 days, and only 3 patients were transferred to another hospital instead of being discharged home. Postoperative events occurred in 3 cases (18.8%), and 2 required reintervention. The mean follow-up period was 7.6 ± 5.2 months. During follow-up, 1 late reintervention was performed, and 1 aortic-related late complication was observed, but did not require intervention. The mean aortic diameter shrinkage was -3.4 ± 4.9 mm. **Conclusion:** Complex aortic aneurysms can be treated with a PMEG technique based on the Treo platform, associated to acceptable safety and efficacy results.

Penetrating aortic ulcer requiring unique treatment

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Penetrating aortic ulcer (PAU), is once of acute aortic syndrome. With an estimated incidence between 0.3 to 2.1 per 100 000 person/year. Due to the ulcerative and degenerative nature of the disease, PAU can be associated with high risk of progression into aortic dissection or rupture and concomitant aneurysm. In Central Hospital of Northern Pest - Military Hospital, the number of cases of thoracic aortic diseases requiring surgery was 114 in the last 10 years. There were 20 cases of PAU requiring surgical treatment, which were treated endovascularly. I would like to highlight one case from this group of patients that required a special solution due to a co-morbidity. The 69-year-old man was admitted with chest pain and dyspnea and sweating. CT angiography confirmed PAU in the middle of the aortic arch. The patient had Ormond's disease (retroperitoneal fibrosis), which encircled the iliac vessels, causing their stenosis and rendering conventional endovascular treatment unsuitable. Considering the need for Z0 debranching, a sternotomy with aorto-anonyma-carotid bypass surgery was performed, followed by a TEVAR procedure from ascending aortic puncture in one sitting. The stent graft was positioned at the origin of the brachiocephalic artery. Control angiography without endoleak depicted a well-functioning bypass with retrograde perfusion of the left subclavian artery. The patient had to be reoperated due to bleeding from the ascending puncture site. Left limb weakness on postoperative day 3 was due to small ischaemic nodules in the area of middle cerebral artery, which required conservative management. Her condition gradually improved. Patient was discharged home without complaints after rehabilitation treatment. This presentation introduces a unique but less burdensome solution to a rare but rupture-prone disease, PAU.

Perioperative and short-term results of standardized PMEG workflow to treat complex abdominal aortic aneurysms

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Objective: To evaluate the feasibility and safety of a standardized approach for fenestrated physician-modified endograft (PMEG) implantation using the Valiant Captivia platform (Medtronic) for complex abdominal aortic aneurysms, incorporating the punch card technique and Hungaroring reinforcement. **Methods:** A cohort of patients

with juxtarenal or pararenal aortic aneurysms >5.5 cm was evaluated for expedited PMEG fenestrated endovascular aneurysm repair (FEVAR). Anatomical suitability was assessed using computed tomography angiography. The primary operator planned the procedure using 3Mensio Vascular software. Custom fenestrations were created and reinforced with Hungarorings. The device was modified, reloaded, and deployed using a specific technique. Patients underwent pre-discharge computed tomography angiography, with subsequent follow-up protocols mirroring those of conventional FEVAR procedures. Results: A retrospective analysis of 9 patients (8 males, 1 female; mean age 75 ± 10.2 years) who underwent PMEG FEVAR was conducted. The average largest aortic diameter was 65.6 ± 29.65 mm. Indications included asymptomatic (n=4) and symptomatic (n=2) non-ruptured aneurysms, and contained ruptures (n=3). The Valiant Captiva platform was used in all cases. Mean operative time was 208 ± 58.9 minutes. All 33 planned fenestrations (3.67 ± 0.5 per patient) were successfully placed using the punch card technique and Hungaroring reinforcement. All target arteries were successfully preserved (33, 100% per vessel technical success rate). Mean postoperative intensive care unit stay was 1.5 ± 2.15 days. Average follow-up was 218.67 ± 215.7 days, with two deaths from heart failure. Conclusion: PMEG FEVAR using the Valiant Captiva platform (Medtronic), combined with the punch card technique and Hungaroring reinforcement, demonstrated high technical success in treating complex aortic aneurysms. These innovations may improve precision, speed, and potentially long-term durability of repairs. Further studies with larger cohorts and longer follow-up are needed to assess long-term outcomes.

Prostate Cancer Diagnosis: A Retrospective Analysis of MRI Results and Anamnesis in 6000 Patients

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Introduction: Prostate cancer remains one of the most prevalent cancers in men, necessitating improved diagnostic approaches. This research aims to carry out a radiomics analysis of prostate MRI taking into account patient anamnesis in order to find novel radiomics biomarkers for the differentiation of prostate cancer and prostatitis.

Methods: Our retrospective study includes 3T MRI results from nearly 6,000 patients treated at the National Institute of Oncology, Budapest since 2008. The MRI sequences studied include T2-weighted imaging (T2WI) for anatomical detail, diffusion-weighted imaging (DWI) for cellular density differences, dynamic contrast-enhanced (DCE) imaging to assess vascular properties. Results: We are currently in the patient screening stage, focusing on analyzing MRI data alongside detailed patient anamnesis. The study will identify patterns in MRI results that correlate with clinical history, prognosis and evaluate the accuracy of radiological opinions in diagnosing prostate cancer. By examining multiple parameters such as tumor size, location, and staging from MRI, alongside patient-reported symptoms and risk factors, we hope to uncover key diagnostic indicators that could enhance early detection and improve patient outcomes. Conclusions: The comprehensive dataset, spanning over a decade, allows us to explore the evolution of imaging techniques and their impact on prostate cancer diagnostics. The results from this study are expected to contribute valuable insights into the role of advanced imaging in cancer detection and may guide future clinical protocols for prostate cancer screening and diagnosis.

Pushing Boundaries in the Aorta: Innovative Solutions for PAU Surgery

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A 69-year-old male patient presented with chest pain and dyspnea to the hospital on December 4, 2024. A CT angiography was performed, after which a penetrating atheromatous ulcer was identified in the aortic arch. No endovascular approach was possible due to the feel of Ormond disease (retroperitoneal fibrosis), and therefore the surgical team opted for open procedures-aortic arch debranching and stent graft implantation. The procedure was done on January 9, 2025. Following the meticulous preoperative preparation, median sternotomy was performed under general anesthesia. The pericardium was incised, and this gave access to the aortic arch with its great branches. After systemic heparinization, a partial occlusion of the ascending aorta was performed, followed by a longitudinal aortotomy. A specialized 14×7 mm bifurcated graft was implanted for adequate flow. The graft limbs were passed under the brachiocephalic vein and directly anastomosed to both left common carotid and brachiocephalic arteries. Reinforced pledgets of Teflon were placed in a suture in the ascending aorta, after which the stent graft was placed in the arch of aorta under appropriate adjunct instruments. The graft was positioned at the origin of the brachiocephalic artery and the placement was expanded using a Tri-lobe balloon. The final angiography showed favorable perfusion through the aorto-brachiocephalo-carotid bypass. Thereafter, a critical hemostasis was achieved, and challenging revisions were made before finally closing the wound over two pericardial drains. Modern vascular surgery is a continuous quest for development and cooperation. The key to their success, of course, is teamwork, planning, and practice for the benefit of receiving the best possible

treatment for the patient. As a surgical nurse I count my luck that I can be part of this dedicated and closely knit family.

Role of Inflammatory and Autoimmune Processes in the Development of Abdominal Aortic Aneurysms

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Introduction: Ruptured abdominal aortic aneurysms (AAA) account for 1–2% of all deaths, yet the precise pathomechanism underlying AAA formation remains unclear. Emerging evidence suggests that systemic autoimmune responses and associated inflammatory pathways play a key role in the structural deterioration of the aortic wall, contributing to disease progression. **Aim:** This study aims to elucidate the contribution of inflammatory and autoimmune mechanisms in the pathogenesis of AAA. A long-term objective is to identify a potentially reversible stage of disease progression and find new therapies which slow aneurysm expansion. **Methods:** Biological samples were collected from patients undergoing open AAA repair at the Department of Vascular and Endovascular Surgery of Semmelweis University. Aneurysmal vessel wall and intraluminal thrombus samples were obtained intraoperatively, while blood, serum, plasma, saliva, urine, and stool were collected in the perioperative period. Histopathological findings were correlated with inflammatory markers, including interleukin-6 (IL-6) and C-reactive protein (CRP) and immunoserological parameters (specific autoantibody profiles). **Results:** A total of 93 patients (19 women, 74 men; mean age: 68.8±7 years) were included. Preliminary (n=33) histological analysis revealed significant vascular inflammation in 19 cases, subclinical inflammation in 11 cases, and no detectable inflammation in only 3 cases. A positive correlation was observed between CRP and IL-6 levels ($p<0.05$). Autoantibody positivity was detected in 62.6% of patients (n=57), with multiple autoantibodies present in 31 cases. The most frequently identified autoantibodies included anti-phospholipid antibodies (lupus anticoagulant [LA], anti-cardiolipin [CL], anti-beta-2-glycoprotein [Beta2GPI]) and antinuclear antibodies (ANA). Women exhibited a significantly higher prevalence of vasa vasorum vasculitis ($p<0.05$). **Conclusion:** A significant proportion of AAA patients exhibit histopathological signs of vascular inflammation, with local inflammatory and autoimmune processes playing a crucial pathogenic role.

The Role & Kinetic Effect of the Supra-Endothelial Vortical Turbulent Blood Flow Sheet, inside The Aortic Arch

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The Role of the Vascular Wall, Thrombus, Blood, and Gut Microbiome in the Development of Abdominal Aortic Aneurysms

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Introduction: Abdominal aortic aneurysms (AAA) affect 1–5% of the adult population, with rupture accounting for 1–2% of all deaths. Microbial involvement in AAA formation, including mycotic aneurysms, has long been recognized. **Objective:** Our study aimed to characterize and compare the microbiome of healthy and aneurysmal aortic walls and to determine the etiopathological role of gut bacteria potentially disseminated hematogenously into the vascular wall. **Methods:** We collected whole blood, oral and anal swabs, aneurysmal wall, and intraluminal thrombus samples from patients undergoing open AAA surgery at the Department of Vascular and Endovascular Surgery. RNA was extracted from these samples, and the V3–V4 region of the 16S rRNA gene was analyzed. Microbiome characterization (alpha and beta diversity, enzymatic activity) was performed using the CosmosID application. **Results:** We included 21 patients who underwent open AAA surgery. Significant differences were observed in alpha ($p=0.0001$) and beta ($p=0.001$) diversity between healthy and aneurysmal aortic walls. Proteobacteria prevalence increased from 34% in healthy aortic walls to 71% in aneurysmal walls, while Firmicutes, Bacteroidetes, and Actinobacteria were significantly reduced. Escherichia and Escherichia-Shigella were abundant in blood, whereas other aneurysmal wall and thrombus-associated bacteria were only minimally detectable in circulation. Enzymatic activity significantly differed between healthy and aneurysmal tissues ($p<0.05$). Immunoseropositive and immunoseronegative patients exhibited distinct blood and tissue microbiome compositions. **Conclusions:** The microbiome composition of healthy and aneurysmal aortic walls differs significantly. Some bacteria detected in aneurysmal walls may originate from the gut microbiome. Bacterial enzymatic activity may influence AAA progression. Immune serology appears to correlate with tissue microbiome composition, suggesting a bidirectional relationship.