anterior border of the sternocleidomastoid muscle. Careful, but tedious, dissection was performed to avert potential injury to the surrounding nerves. Dissection of the common carotid artery was accomplished. However, distal control of the internal and external carotid arteries could not be achieved owing to the large size of the mass. Exposure of the vagus nerve at the surgical field was obtained, with the identification of the internal jugular vein and its control proximally. The mass was initially approached via its lower pole and then moved upward toward the base of the skull until the entire mass was removed (Fig 2) and sent for histopathologic examination. One week later, the contralateral carotid body tumor was also successfully resected via a similar surgical approach.

Conclusions: Surgical excision of CB-T with occasional preoperative embolization should be considered the only curative option, with very low morbidity and mortality when applying meticulous vascular surgical techniques. In addition, we believe that surgical treatment of bilateral CB-Ts should be staged.


THORACIC

Smart and Sensing Endovascular Robot Sentante

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Objective: Endovascular robots, in addition to the standard benefits of medical robotic systems (ie, preciseness, workplace ergonomics), provide a huge advantage—they can protect medical personnel from hazardous x-rays. Although the first endovascular robot systems were approved by the Food and Drug Administration in 2012, they were not widely available even in the best-equipped hospitals in 2021. Fewer than 100 installations of two existing endovascular robot systems across the world had occurred as of 2019. These robot systems have not become widespread because of their limited usefulness. Only one part of the procedure could be performed robotically, with a limited choice of endovascular instruments (ie, 0.014-in. wires, monorail stents only). These robots are manipulated using joysticks and video game-like controls without haptic feedback. A new endovascular robot system, Sentante (Fig), created by Inovatyvi Medicina (Vilnius, Lithuania), is compatible with most common endovascular instruments (0.014-in.-0.035-in. guidewires, 2F-8F catheters). It can manipulate three endovascular instruments simultaneously at full length, providing close to natural haptic feedback. A first in vivo trial was planned, with approval (C2-153) obtained on January 21, 2020 from the State Food and Veterinary Service. The primary end points were (1) the technical success rate in reaching the desired vessel branches with different guidewires after cannulating the origin of the artery; and (2) the number of injured vessels during manipulation with the endovascular robot (safety end point). The secondary end point was the users’ opinions regarding the haptic feedback (adequacy in force and time).

Methods: One pig (age, 4 months; weight, 32 kg) was used in the experiment. Three different wires, ranging from 0.014 in. to 0.035 in. were tested by three doctors (different specialties, different experience levels). A total of 19 target arteries were set as the goal.

Results: The technical success rate was 100%, and the number of injured vessels was 0%. All the participants commented that the Sentante technology had exceeded their expectations. Haptic feedback was evaluated on a scale ranging from 1 to 5. The median result was 4.

Conclusions: Sentante is in the final development stage of numerous animal trials. The first in human procedure is planned for 2023. The ability to perform the full procedure robotically will set the background for real-life remote interventions.


Treatment of Type Ia Endoleak Using Laser Fenestration for Placement of an Endograft to the Left Subclavian Artery

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Objective: We sought to demonstrate the feasibility of laser techniques in treating type Ia endoleaks (TiaEs) of the left subclavian artery (LSA).

Methods: The laser procedure to create the stent graft includes seven stages: (1) image fusion, (2) stent graft placement at the level of the target arteries, (3) catheterization through the left brachial artery with the Tour-Guide steerable sheath (Medtronic, Dublin, Ireland), (4) use of a 0.9-mm laser catheter (Spectranetics, Colorado Springs, Colo) for stent graft perforation, (5) predilatation with a 2.5-mm cutting balloon, (6) a second predilatation with a 4 × 20 balloon, and (7) stenting with an Advanta V12 stent (Getinge, Gothenburg, Sweden) and flaring with a 10 × 20 balloon. We performed a laser procedure at the renovisceral artery level in September 2016 and have 63 cases, including 4 for the LSA (20 for TiaEs, including 2 for the LSA).

Results: A 68-year-old female patient with a 60-mm diameter proximal thoracic aneurysm diagnosed with a TiaE as a complication morbidity of thoracic endovascular aneurysm repair. The TiaE had been caused by a very short and irregularly shaped upper neck. Precise sizing was prepared for laser fenestration to the LSA procedure. Two Valiant stent grafts (Medtronic) were deployed just below the common brachiocephalic trunk. Catheterization was performed through the left brachial artery. Next, laser perforation of the stent graft was performed, and an Advanta V12 stent was deployed to the LSA. Intraoperative angiography and postoperative computed tomography showed exclusion of the TiaE and patency of the stent to the LSA.
Conclusions: We found that the advantages of laser-made vs custom-made stent grafts in the treatment of TIAE after thoracic endovascular aneurysm repair include immediate availability, easier sizing, simpler performance, and less expensive.


A Strategy of Delayed Repair for Blunt Thoracic Aortic Injury: Experience From a Saudi Arabian Center

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Objective: In 2016, Saudi Arabia had the highest death rate associated with road injuries of any high-income country, at an estimated 28.8 per 100,000 person, with a total count of fatalities at 9031. Blunt thoracic aortic injury (BTAI) is the second leading cause of death from trauma. To the best of our knowledge, no series of BTAI and treatment outcomes from Saudi Arabia has been reported. We report our experience of a strategy of delayed treatment in the management BTAI from 2016 to 2021 in Riyadh, Saudi Arabia.

Methods: The prospective data of all BTAI patients who had undergone thoracic endovascular aortic repair between May 2016 and April 2021 in a single center were collected. The medical records of 26 patients were subsequently reviewed.

Results: A total of 26 patients (25 men and 1 woman) with BTAI had been admitted during the study period. The mean age was 30.5 years (range, 17-83 years). The mean injury severity score was 45. The BTAI grade on computed tomography was grade 2 for 1 patient (7.6%), grade 3 for 21 patients (80%), and grade 4 for 3 patients (11.5%). Thoracic endovascular aortic repair was performed after patient stabilization and treatment of other more immediate life-threatening injuries if the BTAI had been deemed to be stable (23 of 26 patients). A single thoracic stent graft was deployed in all 26 patients. The mean interval from the diagnosis to surgery was 96 hours. The rate of procedural conversion to open surgery was 0%, and the proportion of left subclavian artery coverage was 76%. One patient (3.8%) had died within 30 days of surgery and five patients (19%) had experienced acute kidney injury requiring renal replacement therapy but recovered fully. No stent-related complications occurred.

Conclusions: The current society guidelines have advised early repair within 24 hours of BTAI. Our series has demonstrated favorable early outcomes with a strategy of selective delayed repair. The appropriate timing of intervention has been controversial. However, several recent reports of pooled data have shown a survival advantage with a delayed strategy approach. The findings from our experience would support this assertion.


The End of Wire Wrapping: A Technique to Avoid Intertwining Preloaded Guidewires for Endovascular Aortic Arch Repair

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Objective: The development of new endografts and techniques has improved the results of endovascular aortic arch repair in recent years. Fenestrated endovascular repair is now the new frontier to be crossed. However, certain technical barriers have prevented further progress in endovascular arch repair. The purpose of this study was to present a new technique for endovascular aortic arch repair for one, two, or three vessels using preloaded wires and precannulated target vessels without wire wrapping.

Methods: Our technique uses a prototype catheter with two parallel lumens to position through-and-through guidewires in the supra-aortic branches and an extra-stiff guidewire in the ascending aorta with no wrapping (Fig 1). This allows for the introduction and advancement of the device with the precannulated target vessels. The endograft is advanced to the aortic arch without twisting or wrapping (Fig 2). Covered stents are deployed to align the graft and target vessels.

Results: Angulation of the aortic arch, twisting, and wire wrapping have been important concerns related to the deployment of aortic arch endografts. We have described the first-ever successful case of endovascular aortic arch repair with more than one precannulated supra-aortic branch and no wire wrapping.

Conclusions: To the best of our knowledge, this technique, which avoids wire wrapping, has not been previously described. This specially designed prototype catheter allows for the positioning of the guidewires in ‘parallel’ without intertwining. This technique also allows for safer and faster endovascular arch procedures and opens new possibilities of enabling multivessel endovascular aortic arch repair with all precannulated target vessels.