Complex EVAR procedure
performed with Discovery IGS 730

by
Pr. Stephan Haulon,
University Hospital of Lille, France
Introduction

Pr. Stephan Haulon is head of the Vascular Surgery Department of Lille University Hospital, which performs about 250 endovascular aortic repair (EVAR) procedures a year, including treatment of infra-renal, para-renal and thoraco-abdominal aneurysms.

The typical workflow used by Pr. Haulon during complex EVAR procedures is illustrated here on a FEVAR procedure with four branches. The patient was treated in the Discovery* IGS 730 hybrid OR, equipped with the (T)EVAR Assist solution. (T)EVAR Assist is an integrated solution to help plan, guide and follow-up (T)EVAR cases and includes VesselIQ* Xpress, VVI, Synchro3D and Innova* Vision.
Patient preparation

At the beginning of the procedure, the imaging system is away from the table to enable full access to the patient's head and arms and facilitate the work of the anesthesiologists.
Preparation of the 3D CT images

CT images are visualized and prepared for 3D overlay in the control room on the Advantage Workstation, the post-processing workstation integrated to Discovery IGS 730. This requires only few minutes to plan from the CTA using 0-click bone removal and vessel tracking. The 3D bone and vascular models are then available and are exported in a single click to Innova Vision, which overlays them on top of the fluoroscopy images.
Cutdown

The imaging system is away from the table, enabling full access to the patient’s sides to facilitate the work of the surgeons performing the cutdown.

Scan me to watch the video
Gantry motion to imaging position

When ready to start imaging, the Discovery IGS 730 is moved to the table using the One-Touch Back-In functionality available from tablesde.
3D CT overlay registration

Registration of the CT model on the current position of the patient is performed from tableside using the touchscreen. It takes a few minutes to align the bony structures of the CT on two fluoroscopy shots acquired in the frontal and lateral angulations.
Follow the table

As the tabletop is panned to image the visceral or iliac arteries, the 3D model automatically follows, allowing centering of the anatomy of interest without need to shoot X-ray.

Imaging of the visceral arteries

Imaging of the iliac arteries
Follow the gantry

As the C-arm is moved to image perpendicular to the vessels of interest, the 3D model automatically follows without the need to shoot X-ray. The table position can be adjusted to properly center the anatomy of interest in this new angulation. For infra-renal and thoracic EVAR, the targeted proximal landing zone can be drawn as a ring before the procedure and overlaid to help find the angulation perpendicular to the vessels.

Scan me to watch the video
Fine tuning of the registration

The position of the 3D overlay is fine-tuned to compensate for vessel deformations that may occur after the insertion of the endograft sheath. The targeted vessels on the CT overlay are aligned from tablesde with the vessels visible on angiographic images.
Deployment of the endograft

The endograft is inserted under fusion guidance to help position the endograft at the right height and angle.
Cannulation of visceral arteries

Navigation into the ostia of the visceral arteries is done under guidance of the 3D fused images. In this case, cannulation through the four fenestrations was achieved in 30 minutes without any contrast media injection.
Deployment of the stents and endograft

Angiograms are acquired to check the permeability of the visceral arteries after stent deployments.
Completion angiogram
A completion angiography is performed to check for endoleaks.
Cutdown closure

At the end of the procedure, the Discovery IGS 730 is positioned away from the table using the One-Touch Back-Out. This frees access to the patient's sides and facilitates the work of the surgeons closing the cutdown.
Pr. Haulon’s team at CHU of Lille uses multiple strategies of dose saving, resulting in a median Dose Area Product (DAP) of only 44 Gy.cm² (minimum 16 Gy.cm² - maximum 147 Gy.cm²) and median fluoro time of 34 min (minimum 18 min - maximum 67 min) during the first 25 procedures of complex juxtarenal and thoracoabdominal EVAR.

Median DAP of 233 to 697 Gy.cm² (5 to 15 times higher than in Lille) and median fluoro times of 35 min to 83 min are reported in the literature for this type of procedures ¹,²,³

¹ - In clinical use, the results of dose reduction techniques will vary depending on the clinical task, patient size, anatomical location and clinical practice.

² - Approximated Dose per IEC 60601-2-43 (20 cm PMMA phantom).

³ - Only valid when the maximum fluoro entrance dose is not reached.

⁴ - Default settings of the aorta and aorta arch protocols of the Discovery IGS 730.

⁵ - Compared to the default settings of the aorta and aorta arch protocols of the Discovery IGS 730 with 16 cm FOV.

In clinical use, the results of dose reduction techniques will vary depending on the clinical task, patient size, anatomical location and clinical practice.
Applications & imaging modes

**Fusion imaging**

Pr. Haulon gets 3D vascular map from the pre-operative CT without need to perform an intra-operative 3D acquisition (which generates 4.2 to 24 Gy.cm² of DAP according to phantom studies 4, 5, 6 and 37 Gy.cm² according to a study on patients 7). If used, intra-operative 3D acquisition (cone beam CT) would represent an additional dose of 10% to 85% of the median total exam DAP measured in Lille. Centering of the anatomy and optimization of the C-arm angulation is done without shooting x-ray by leveraging the capacity of the 3D mask to follow the table and gantry movements.

**Fluoroscopy**

When clinically relevant, Pr. Haulon performs fluoroscopy rather than DSA runs. This applies, for example, to the roadmap imaging used during endograft legs positioning on the iliac arteries where the mask is acquired in fluoroscopy.

**Bibliography**


Configuration of the hybrid operating room

The room size is 58 m² (624 ft²), of which approximatively 10 m² (108 ft²) is for the control room. It is equipped with:

- Discovery* IGS 730 OR
- 2 Steris** monitors suspensions
  - One on the left hand side of the patient with three monitors (Live, Reference and AW/MacLab*), and 1 surgical lamp
  - One on the right hand side of the patient with two monitors (Live, Reference), and one surgical lamp
- Venue 40 ultrasound
- Aisys* Carestation* anesthesia delivery system
- 1 Dräger** large monitor suspension that can be positioned either on the left or right hand side of the patient
About GE Healthcare
GE Healthcare provides transformational medical technologies and services to meet the demand for increased access, enhanced quality and more affordable healthcare around the world. GE (NYSE: GE) works on things that matter - great people and technologies taking on tough challenges. From medical imaging, software & IT, patient monitoring and diagnostics to drug discovery, biopharmaceutical manufacturing technologies and performance improvement solutions, GE Healthcare helps medical professionals deliver great healthcare to their patients.

GE Healthcare, Chalfont St.Giles, Buckinghamshire, UK

Marketing Communications GE Medical Systems
Société en Commandite Simple au capital de 65.146.245 Euros
283 rue de la Minière – 78533 Buc Cedex France RCS Versailles B 315 013 359
A General Electric company, doing business as GE Healthcare
GE and GE Monogram are trademarks of General Electric Company.
* Trademarks of General Electric Company.
** Steris is a trademark of Steris Corporation. Draeger is a trademark of Draegerwerk AG & Co. KGAA. All other trademarks are the property of their respective owner.

© 2013 Copyright GE Healthcare - HCS DGS PA MC 08131 DOC1432662