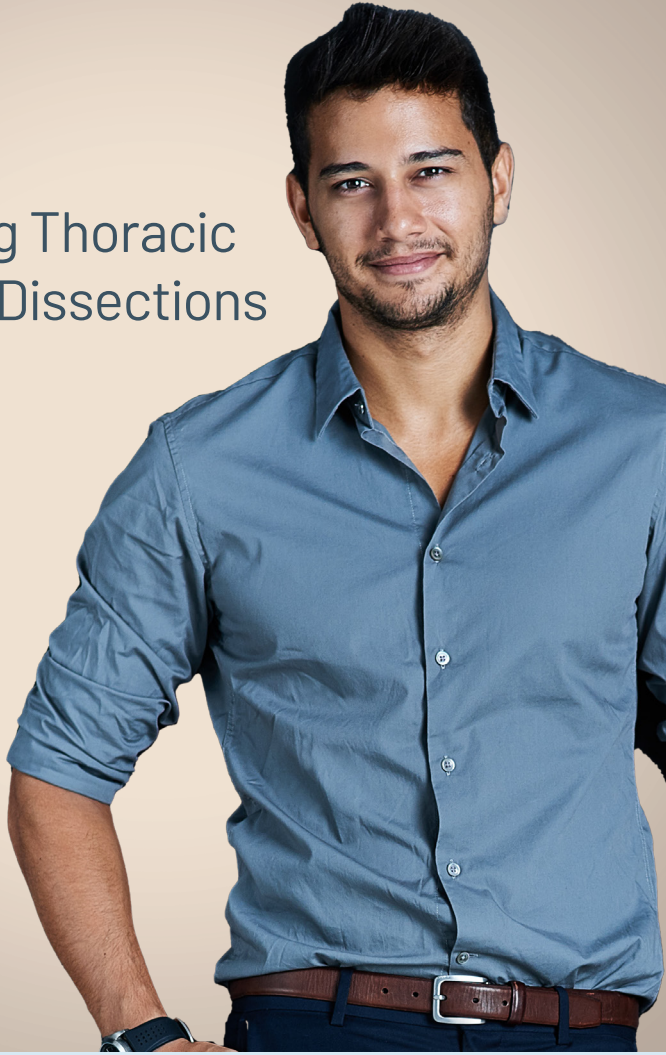


YOUR GUIDE TO
Understanding Thoracic
Aneurysms & Dissections



Patient Information Guide



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Helpful hints

Some words and terms in this guide might be unfamiliar. You can find explanations in the glossary to help you learn more about your thoracic aortic aneurysm.

Introduction

This educational information is provided by Terumo Aortic to help you make an informed decision about the Thoraflex™ Hybrid Frozen Elephant Trunk (FET) device to treat your thoracic aortic aneurysm or dissection.

Since gaining initial European approval in 2012, the Thoraflex™ Hybrid device has been implanted in approximately **13,000+ patients**, in over **40 countries**.*

The Thoraflex™ Hybrid device is manufactured by Terumo Aortic, a global medical device company focused on addressing every patient's aortic needs. Our goal is to work together with your doctor to find solutions that best fit your anatomy.

While you are reading this information, it may be helpful to write down any questions you may have so you can discuss them with your doctor and healthcare team. Only your doctor can decide if you are a good candidate for a Thoraflex™ Hybrid device.

What is an aorta?

The aorta is an artery and the largest blood vessel in the body. It carries oxygen-rich blood away from the heart to the body.

Doctors refer to the upper part of the aorta as the thoracic aorta and the lower part as the abdominal (related to the belly) aorta. (Figure 1)

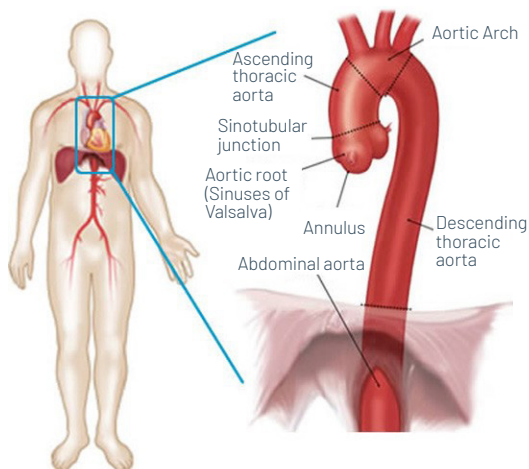


Figure 1 - Diagram of the Aorta

* Based on number of devices sold

What is a Thoracic Aortic Aneurysm?

An aneurysm is a balloon-like bulge in a blood vessel.

It is caused when a section of the blood vessel wall becomes weakened due to trauma or disease caused by; smoking, diet or even family history. Over time the pressure caused by the blood flowing through the blood vessel expands the weakened section of the wall causing it to bulge outward. (Figure 2)

When an aneurysm occurs in the upper part of the aorta, it is called a thoracic aortic aneurysm.

Are there risks associated with a thoracic aneurysm?

If an aneurysm expands too much, it can burst or rupture.

Early diagnosis and medical treatment may reduce the risk of an aneurysm expanding too far and causing rupture. If it does rupture then there is a high risk of death.

Even without a rupture, dissection can cause a problem of aortic dissection where the vessel supplying blood to the organs in the body narrows down or is completely blocked resulting in organ failure (malperfusion).

What are the symptoms associated with a thoracic aortic aneurysm?

As a thoracic aortic aneurysm grows, some people may notice:

- ▶ Tenderness or pain in the chest
- ▶ Back pain
- ▶ Hoarseness
- ▶ Cough
- ▶ Shortness of breath



Figure 2 – Example of an Aortic Aneurysm

<https://www.mayoclinic.org/diseases-conditions/thoracic-aortic-aneurysm/symptoms-causes/syc-20350188>

What is a Thoracic Aortic Dissection?

A dissection is a tear in the lining of the aorta, that allows blood to flow between the 3 layers of the aortic wall (Figure 3). This can weaken the wall and potentially lead to an aortic rupture. A dissection can be caused by high blood pressure over a long period of time, if an aortic aneurysm already exists as this weakens the wall, genetic factors (occurs in families) or trauma i.e., a car crash.

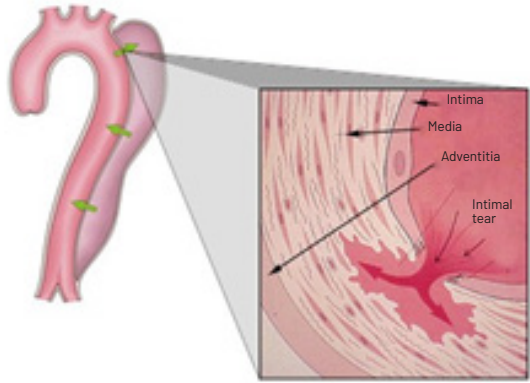


Figure 3 – An Aortic Dissection

Are there risks associated with a thoracic aortic dissection?

Yes. A dissection can weaken the aortic wall and potentially lead to a rupture. If it does rupture, then there is a high risk of death.

What are the symptoms of a thoracic aortic dissection?

- ▶ Sudden severe chest or upper back pain, often described as a tearing, ripping or shearing sensation that radiates to the neck or down the back
- ▶ Sudden severe abdominal pain
- ▶ Loss of consciousness
- ▶ Shortness of breath
- ▶ Sudden difficulty speaking, loss of vision, weakness or paralysis of one side of your body, like those of a stroke
- ▶ Weak pulse in one arm or thigh compared with the other
- ▶ Leg pain
- ▶ Difficulty walking
- ▶ Leg paralysis

<https://www.mayoclinic.org/diseases-conditions/aortic-dissection/symptoms-causes/syc-20369496>

What are my treatment options?

Your doctor will determine your best method of treatment based on a number of factors such as your age, current state of health, the size of your aneurysm or dissection and how fast it is progressing. Small aneurysms or dissections that are found early and not causing symptoms may not need immediate treatment or might be treated with medication.

Large or fast-growing aneurysms or dissections will need to be repaired to prevent a rupture. The standard method for repair is a traditional open surgical technique. The extent of aorta that needs to be treated varies patient to patient.

An open surgical repair is the traditional procedure used to repair an aneurysm or dissection. During the procedure, the surgeon makes a large incision (cut) in the chest while the patient is under general anesthesia (a method used to eliminate pain and keep the patient in a controlled state of unconsciousness). The surgeon opens the aneurysm and sews a graft to the healthy part of the aorta. The graft is a tube-like device typically made of a woven polyester material (Figure 8). When a second stage is needed to treat disease that extends further toward the abdomen, this is conducted by either open surgery with a surgical graft (Figure 9) or by the addition of stent(s) (Figure 10). In both cases this creates a new channel for blood to flow through thus totally excluding the disease.



Figure 8



Figure 9



Figure 10

As with all surgical and endovascular procedures, there are associated risks. Your doctor will discuss the risks and benefits with you. Only your doctor can determine the most appropriate treatment for you.

About the Thoraflex™ Hybrid Device

What is the Thoraflex™ Hybrid device?

It is implanted and replaces the aorta using an open surgical technique.

The Thoraflex™ Hybrid device has two main parts, a traditional graft section which is connected to a stented section. The stented section is compacted inside a sheath before it is deployed within the aorta (Figure 11).

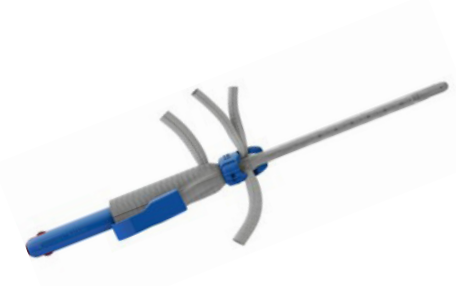


Figure 11 -
Compacted stent
inside a sheath

The graft section replaces the diseased aortic arch and associated blood vessels which are reattached. The stented section has metal rings that expand when deployed (Figure 12).

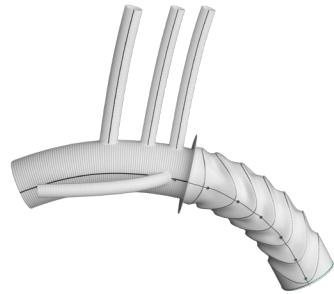


Figure 12 - Graft and
expanded deployed stent

The Thoraflex™ Hybrid device comes with a deployment system which keeps the stented section compacted, allowing the surgeon to place this part down inside the aorta during surgery.

When deployed the stent section expands to create a channel within the aorta for blood to flow through and supply the body. It also creates a seal inside the aorta preventing blood flowing back into the diseased part of the aorta (Figure 13). In some cases, a physician may decide to complete the sealing as part of a second stage procedure.

How does it work?

When the Thoraflex™ Hybrid is implanted within the aorta, it creates a channel for the blood to flow through and passes the damaged or diseased portion and into the lower healthy section of your aorta.

See **“Will I need more surgery later?”** on page 11.

How is it implanted?

If your doctor decides a Thoraflex™ Hybrid device is the best method of treatment you will receive general anesthesia (a method used to eliminate pain by preventing sensation) and be placed on a heart-lung machine. This temporarily takes over the function of the heart and lungs during surgery. The surgeon then opens the chest cavity via an incision via the sternum (also known as the breastbone) to repair the aorta. When the device is fully implanted (Figure 13), the surgeon closes the incisions.

This type of surgery usually takes at least six hours, and you will have to stay in the intensive care unit after surgery. You can expect to stay in the hospital for 10 days, but maybe longer. The length of surgery and hospital care thereafter will depend on your medical condition, any additional treatment you require, and standard medical care and procedures at the hospital. Your doctor will discuss this with you in detail.

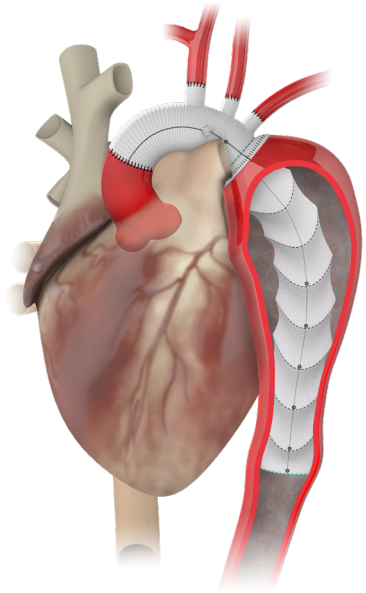


Figure 13 - Implanted Thoraflex™ Hybrid device

Are there risks associated with the Thoraflex™ Hybrid device?

As with any surgery, the FET procedure comes with potential risks. Please discuss all risks with your doctor. The risks associated with using Thoraflex™ Hybrid largely coincide with those of all aortic arch surgery but also include those associated with stented grafts. These risks include, but are not limited to:

- ▶ Endoleaks – blood flow continues to flow into the diseased part of the aorta
- ▶ Device - related issues such as breaking of sutures or metal parts, fabric defects/tears or component separation
- ▶ Continued disease progression
- ▶ Rupture
- ▶ Additional endovascular or surgical procedures
- ▶ Heart attack
- ▶ Stroke
- ▶ Kidney failure
- ▶ Spinal cord injury
- ▶ Distal stent-graft induced new entries (dSINE)

Your doctor will discuss the risks and benefits with you. Only your doctor can determine the most appropriate treatment for you.

Are there benefits associated with the Thoraflex™ Hybrid device?

There are a number of potential benefits with the Thoraflex™ Hybrid device. Potential benefits include: Thoraflex™ Hybrid reduces the risk of aortic rupture and aortic related mortality in patients diagnosed with a damaged or diseased aortic arch and descending aorta in cases such as aneurysm and dissection; it allows the possibility of treatment in a single-stage procedure; it stabilizes the thoracic aorta and facilitates subsequent repairs if a second-stage is necessary.

Thoraflex™ Hybrid Clinical Study Summary

Thoraflex™ Hybrid was assessed for safety and effectiveness in a 65-subject study conducted in the United States.

Patients enrolled in this study were followed for three years.

The device was evaluated based on the percentage of patients without major adverse events in the year after implant. Major adverse events are permanent stroke, permanent paraplegia/paraparesis, unplanned aortic reoperation, and death: 15 out of 65 subjects in the study had a total of 19 such events. That means that the percentage of patients without such events was 77%.

Although the types of risks are similar to open surgical procedures, please talk to your doctor to better understand how Thoraflex™ Hybrid compares to the other types of treatment.

Seven patients (11%) died in the year following treatment in this study, there were five disabling strokes (8%) in the year after the operation, three patients (5%) required reoperation and three patients (5%) experienced permanent paraplegia or paraparesis.

Your risk of having these events may be higher or lower. You should discuss the likely risk of these events throughout your life with your doctor and discuss how the risks and benefits of Thoraflex™ Hybrid may apply to you.

Your recovery

What happens after the procedure?

Before you are released from hospital, your doctor or nurse will discuss your follow-up care and ensure all your concerns are addressed. A series of follow-up appointments will be organized so you can meet with your surgeon and local doctor.

Will I need more surgery later?

Some patients who undergo FET subsequently require further treatment lower in the aorta (the descending thoracic aorta or thoracoabdominal aorta) because their disease continues to progress beyond the initial area of treatment or is already extensive and staged treatment is planned to reduce the risk of spinal cord injury. This is called distal extension and is typically performed using endovascular repair.

The Relay[®]Pro NBS stent-graft is indicated for distal extension of Thoraflex[™] Hybrid and can be implanted via an incision in the groin using keyhole surgery. If further treatment with a Relay[®]Pro NBS device is required, a patient guide that presents an overview of that device will be provided to you.

Post-operative care

Follow-up

Depending on the type of **intervention, localization and type of aortic disease**, different follow-up appointments are required.

The first year of post-operative care serves to monitor the outcome of the operation and the review of complications that can arise from the surgery. Thereafter the follow-up serves to identify new aortic changes.

After surgery

A CT angiography is the best imaging method to examine the aortic arch and thoracoabdominal aorta.

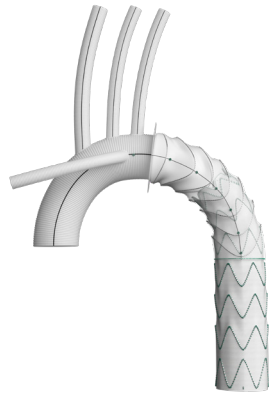


Figure 14 - Thoraflex[™] Hybrid Extended with a Relay[®]Pro NBS Stent-Graft

If there is a reason why you should not have a CT then Magnetic Resonance Imaging (MRI) can be used to carry out the follow-up examination. To reduce radiation exposure in young patients, an MRI examination is recommended so long as an exact anatomical assessment is not necessary.

The first follow-up examination usually takes place before you leave the hospital. Further imaging is recommended **after 6 months** and following that, annually.

Lifestyle

After completing a rehabilitation plan, you should be able to return to **daily life or work as usual**. Since the healing process is different for every person, it is difficult to be precise.

In addition, if you need to take blood thinners (eg. warfarin) some professions and hobbies should be stopped.

The breastbone should heal after **about three months** and you can again take up exercise. Take care to exert yourself steadily. Endurance exercise (walking, bicycle riding, jogging, swimming) and moderate strength training are suitable.

Driving

You should **refrain** from **driving a car for the first six weeks** because glancing over your shoulder and turning the steering wheel will put pressure on the chest that can cause pain.

As a passenger, take time getting in and out of a car to protect your chest. Using a seat belt is still mandatory after an operation.

Medication

Next to surgery, medication plays an important role. Risk factors like too high blood sugar or high blood pressure must be addressed as part of your treatment.

After an aortic intervention, you should take a platelet aggregation inhibitor, like **aspirin 100mg (once daily) for the rest of your life**. An exception is when warfarin is necessary for blood thinning.

Travel and wellness

Long trips can be taken **three months after surgery** at the earliest.

Take an **adequate supply of medicine** as well as a copy of your **medical report**. Also, use **caution when carrying** heavy luggage. Flying after being discharged from the hospital is possible.

Sauna visits should first be enjoyed no earlier than **three months after** the operation.

Implant Card

Before leaving the hospital, you will be given a patient implant card. Along with your personal information, the following is included:

- ▶ Your implant(s) model and ID number
- ▶ Hospital name
- ▶ Doctor's name
- ▶ Nurse's name
- ▶ Date of implant
- ▶ Manufacturers name and contact information
- ▶ MRI safety conditions

Keep this card with you at all times.

Please share this information with your healthcare providers and make them aware you have been treated with a Thoraflex™ Hybrid device.



Questions to ask your doctor

- ▶ Are you familiar and comfortable performing a Frozen Elephant Trunk Technique procedure and how many procedures have you conducted?
- ▶ What are my best options for treating my aneurysm or dissection?
- ▶ Am I a candidate for this type of open surgery or would more conventional open or even endovascular surgery be better?
- ▶ What are the benefits and risks of performing a Frozen Elephant Trunk, more conventional surgery or endovascular surgery?
- ▶ Could an endovascular approach be an alternative option for me?
- ▶ What should I expect after my procedure and how often do I need to follow up with you or my family doctor?
- ▶ How critical is it for me to continue the prescribed treatment plan?
- ▶ How long will the device be implanted in my body?
- ▶ What should I expect if my aneurysm or dissection disease is not resolved?
- ▶ How much of the cost of my procedure will be covered by my health insurance?
- ▶ Will I have to change my lifestyle activities after the procedure? If so, for how long?
- ▶ Where can I get more information?

Together with your doctor, you will decide on your best treatment option.



Where can I get more information?

Aneurysms

American Heart Association
(americanheart.org)

Founded in 1924, today the American Heart Association is the largest voluntary health organization fighting cardiovascular diseases and stroke.

Mayo Clinic (mayoclinic.com)

MayoClinic.com is the latest chapter in a long and successful consumer health publishing history of the Mayo Clinic. This presence on the Web is a natural extension of Mayo's long-standing commitment to provide health education to patients and the general public.

Interventional Therapy

Society for Vascular Surgery
(vascular.org/patients)

The Society for Vascular Surgery® (SVS) is a not-for-profit professional medical society, seeking to advance excellence and innovation in vascular health through education, advocacy, research and public awareness. SVS is the national advocate for more than 5,800 specialty-trained vascular surgeons and other professionals dedicated to the prevention and cure of vascular disease.

American Association for Thoracic Surgery (aats.org)

The American Association for Thoracic Surgery (AATS), along with its philanthropic arm, the AATS Foundation, has sought to advance the field of cardiothoracic surgery. It is an international organization whose members have a proven record of distinction within the specialty and have made significant contributions to the care and treatment of cardiothoracic disease throughout the world. The mission of the AATS is to promote scholarship, innovation, and leadership for thoracic and cardiovascular surgery.

Society of Thoracic Surgeons (sts.org)

Founded in 1964, The Society of Thoracic Surgeons is a not-for-profit organization representing more than 7,600 surgeons, researchers, and allied health care professionals worldwide who are dedicated to ensuring the best possible outcomes for surgeries of the heart, lungs, and esophagus, as well as other surgical procedures within the chest. Its mission is to advance cardiothoracic surgeons' delivery of the highest quality patient care through collaboration, education, research, and advocacy and to improve the lives of patients with cardiothoracic diseases.

US National Library of Medicine
(medlineplus.gov)

The National Library of Medicine (NLM), on the campus of the National Institutes of Health in Bethesda, Maryland, is the world's largest medical library. The Library collects materials in all areas of biomedicine and health care, as well as works on biomedical aspects of technology, the humanities, and the physical, life, and social sciences.

Product Information

Terumo Aortic
(terumo-aortic.com)

Terumo Aortic is a global medical device company dedicated to developing solutions for aortic and peripheral vascular disease.

Food and Drug Administration
(fda.gov)

A US government agency intended to promote and protect the public health by helping safe and effective products reach the market in a timely way, and monitoring products for continued safety after they are in use.

US Department of Health and Human Services (hhs.gov)

HHS helps families and individuals stay safe and informed about food, drugs, medical devices, and more. Information is available about medical device safety for consumers, healthcare providers and regulated industry, including device recalls.

Glossary

Aorta

The main artery that carries blood away from the heart distributing it to the rest of the body.

Aneurysm

Occurs when part of an artery wall weakens, allowing it to balloon out or widen abnormally - resulting in the weakening of the vessel wall. Aneurysms can occur anywhere. An Aortic Aneurysm occurs in the major artery from the heart.

Angiography/Angiogram

Angiography is a method whereby dye is injected into the bloodstream to view blood flow through the blood vessels under X-Ray. Angiography utilizes contrast (dye) and small doses of radiation. The resulting images are angiograms.

Contrast (dye)

A liquid injected into the vascular system that allows a doctor to see a patient's blood flow when the patient is exposed to X-Ray.

Computed Tomography Scan (CT/CAT Scan)

An imaging technique that creates very precise, thin, cross-sectional views of the human body. For patients under consideration for AAA treatment, this scan will focus on the abdomen and aorta. This technique often utilizes contrast (dye) and always requires limited radiation exposure.

Delivery Catheter

A medical tool that resembles a long thin tube used by a doctor to enter the body through the vascular system and enables placement and positioning of an endovascular device.

Dissection

A serious condition in which the inner layer of the aorta, the large blood vessel branching off the heart, tears. Blood surges through the tear, causing the inner and middle layers of the aorta to separate (dissect).

dSINE

Pronounced "dee-sign". Distal stent-graft induced new entry is a technical term to describe damage to the aorta caused by the placement of a stent-graft. The metal may tear the vessel wall because of, for example, friction (rubbing) or oversizing of the device.

Endoleak

Unintended blood flow into the Abdominal Aortic Aneurysm after placement of an endovascular graft.

Endovascular Graft

A synthetic graft implanted within a diseased vessel intended to relieve blood pressure on the weakened vessel walls. Endovascular grafts are placed into the blood vessel using a delivery catheter, which enables the doctor to avoid needing to make a large incision on the patient.

Endovascular grafts are compacted within the delivery system. While still small-in-size, they are able to enter the body through the vascular system. Once in proper position, they are then deployed or expanded to the required size based on the blood vessel being treated.

Endovascular Repair

A less invasive option for the repair of an Abdominal Aortic Aneurysm as compared to open surgery. It involves the use of an endovascular graft that excludes (seals off) an aneurysm of a diseased aorta, thereby creating a new path for blood to flow.

The technique uses real time X-Rays allowing the doctor to visualise the location of the device and disease to ensure proper device placement. The doctor will also use a variety of other temporarily placed devices (such as guidewires) to perform the treatment.

Magnetic Resonance Imaging (MRI)

A diagnostic technique that uses magnetic fields and radio waves to visualize structures inside the body.

Malperfusion

A problem of aortic dissection where the vessel supplying blood to the organs in the body narrows down or is completely blocked resulting in organ failure.

Paraplegia

Inability to voluntarily move the lower parts of the body.

Paraparesis

Partial paralysis (limited ability to complete voluntary movement) in the lower body due to disrupted nerve signals from the brain to the muscles.

Platelet Aggregation Inhibitor

A member of a class of pharmaceuticals that decrease platelet aggregation and inhibit thrombus formation.

Spinal cord injury (or ischemia)

The spinal column sends and receives signals from the brain to and from the rest of the body. Damage can occur to these nerve roots in the spinal column that can result in temporary or permanent changes in feeling, movement, strength, and body functions. The spinal cord gets blood from several sources, among them small arteries that come directly from the thoracic aorta. SCI can occur after interventions of the thoracic aorta because these small vessels are blocked by the replacement graft.

Rupture

A tear in the wall of an artery that allows blood to exit the blood vessel and could be a potential life-threatening event. The common term for this is hemorrhage.

Synthetic Graft

A graft manufactured to replace the vessel. They are created by using man-made materials such as polyester.

X-Ray

A form of energy allowing medical providers to see anatomical structures in the body, as well as the stent-graft components in your body.

Indications For Use

The Thoraflex™ Hybrid device is intended for the open surgical repair or replacement of damaged or diseased vessels of the aortic arch and descending aorta with or without involvement of the ascending aorta in cases of aneurysm and/or dissection.

Contraindications for Use

This device should not be implanted in patients who exhibit:

- ▶ Known allergy or intolerance to device materials (polyester, Nitinol, tantalum or materials of bovine origin.)
- ▶ Active infection

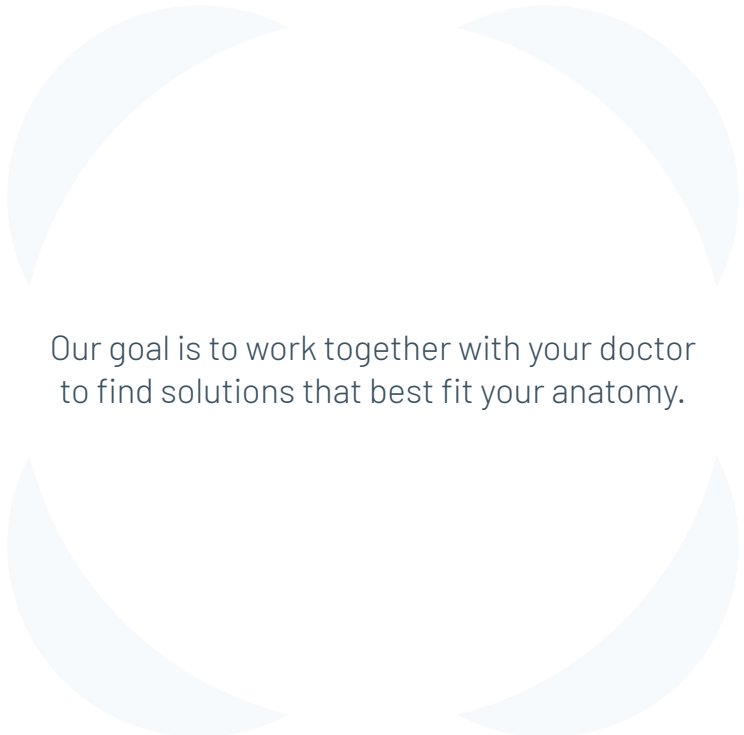
Magnetic Resonance Imaging (MRI) Safety

Conditions for MR Safety

The Thoraflex™ Hybrid and Relay devices are MR Conditional. A patient with these devices can be safely scanned in an MR system meeting the following conditions. Failure to follow these conditions may result in injury.



Static Magnetic Field Strength (Bo)	3.0 or 1.5 T
Maximum Spatial Field Gradient	40 T/m (4,000 gauss/cm)
RF Excitation	Circularly Polarized (CP)
RF Transmit Coil Type	There are no Transmit Coil restrictions
RF Operating Mode	Normal Operating Mode
Maximum Whole-Body SAR	2 W/kg (Normal Operating Mode)
Maximum Head SAR	3.2 W/kg (Normal Operating Mode)
Scan Duration and Wait Time	15 continuous minutes of scan duration with 5 minutes wait time before additional scanning.
MR Image Artifact	In non-clinical testing, the image artifact caused by the device extends approximately 6 mm from the Thoraflex™ Hybrid and Relay devices when imaged with a gradient echo pulse sequence and a 3.0 T MR system.



Our goal is to work together with your doctor
to find solutions that best fit your anatomy.


This leaflet gives only general information for patients.
Your medical practitioner will be able to answer any specific questions you may have on your condition.
This information was produced as a service to medicine by Terumo Aortic.

terumoaortic.com

Discover solutions for every segment of the aorta

Visit our website for more information on use, indications, contraindications, warnings/precautions and availability within your market.

Product availability subject to local regulatory approval.

 Manufactured by: Vascutek Ltd, Newmains Avenue, Inchinnan, Renfrewshire, PA4 9RR, United Kingdom

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The logo features the word "TERUMO" in a bold, green, sans-serif font. A red swoosh underline is positioned beneath the letters "T" and "E".