Summary of Safety & Clinical Performance
Aorfix™ AAA Endovascular Stent Graft with Intelliflex™ Low Profile (LP) Delivery System

A summary of the safety and clinical performance of the device, intended for users/healthcare professionals

This Summary of Safety and Clinical Performance (SSCP) is intended to provide public access to an updated summary of the main aspects of the safety and clinical performance of the device.

The SSCP is not intended to replace the Instructions For Use as the main document to ensure the safe use of the device, nor is it intended to provide diagnostic or therapeutic suggestions to intended users or patients. The following information is intended for users/healthcare professionals.

1. Device identification and general information

1.1 Device trade name
Aorfix™ AAA Endovascular Stent Graft with IntelliFlex™ Low Profile Delivery System
1.2 Legal manufacturer's name and address
Lombard Medical Ltd
Lombard Medical House, 4 Trident Park, Didcot, Oxfordshire, OX11 7HJ, United Kingdom
1.3 Legal manufacturer's SRN (single registration number)
GB-MF-000014515
1.4 Basic UDI-DI
05055715AO01BU
1.5 Medical device nomenclature description/text
GMDN: 46777 (Abdominal Aortic Stents)
EMDN: C019009 AORTIC OCCLUSION SYSTEMS
CND: P070102020201 – Simple Bifurcated Vascular Prosthesis in PTFE
1.6 Class of device
Class III
1.7 Year when the first (CE) was issued covering the device
2016
1.8 Authorised representative name, address and SRN
Medical Device Management Ltd
Block B, The Crescent Building, Northwood, Santry, Dublin 9, D09 C6X8, Ireland
1.9 Notified Body name and single identification number
DQS (0297)

2. Intended use of the device

2.1 Intended purpose

The Aorfix™ AAA Endovascular Stent Graft with Intelliflex™ Low Profile Delivery System is intended to exclude aneurysms from blood circulation in patients diagnosed with abdominal aortic aneurysm (AAA). It is intended for use only by suitably trained physicians who are experienced in the diagnosis and endovascular treatment of aneurysmal disease. Standard techniques for the use of vascular access sheaths, angiography, guidewires, and contrast media should be employed.

2.2 Indications and target populations

Indications for use

The Aorfix™ AAA Endovascular Stent Graft is indicated for the endovascular treatment of infra-renal abdominal aortic, iliac and abdominal aorto-iliac aneurysms with peri-renal neck angles up to and including 65 degrees, including:

- Aortic neck landing zone diameters with a range of 19mm to 29 mm
- Common iliac landing zone diameters with a range of 9mm to 19mm

The endovascular treatment of infra-renal abdominal aortic, iliac and abdominal aorto-iliac aneurysms with peri-renal neck angles up to 90 degrees in case of undue risk of open surgical repair, including:

- Aortic neck landing zone diameters with a range of 19mm to 29 mm
- Common iliac landing zone diameters with a range of 9mm to 19mm

Intended patient population

Inappropriate patient or device selection may result in poor device performance. Patients should be assessed for suitability by the prescribing clinician who should take into account their knowledge of AAA surgery and Endovascular Aneurysm Repair (EVAR) including but not limited to the list below:

- Access vessel diameter, vessel morphology and delivery system diameter should be compatible with vascular access techniques (femoral cut down or percutaneous).
- Key anatomic elements that may affect exclusion of the aneurysm include very severe proximal neck angulation (>90°), short proximal aortic neck (< 15mm centre-line length), distal iliac landing zone < 15mm.
- Aortic necks that dilate by 5mm or more over their 15mm length have been associated with increased rates of migration.
- The presence of calcified plaques in the aortic neck, particularly those that line the transition between the bottom of the neck and the aneurysm sac.
- Irregular calcification, plaque or thrombus may compromise the fixation and/or sealing at the implantation sites.
- Placement of the implant in an aorta with a diameter of 18mm or less in the region of the gate.

The Aorfix™ AAA Endovascular Stent Graft has not been evaluated in patients who:

- Are pregnant or nursing;
- Are less than 21 years old;
- Have traumatic aortic injury, ruptured aneurysms, aneurysms pending rupture or require other emergent aorta or aneurysm treatment;
- Have thoraco-abdominal, suprarenal or abdominal aneurysms where there is no infrarenal neck or have ilio-femoral, mycotic, inflammatory, dissecting or pseudo-aneurysms;
- Have hypercoagulability, bleeding diathesis or coagulopathy;
- Have mesenteric or celiac artery occlusive disease, giving rise to a dominant patent inferior mesenteric artery.
- Have connective tissue disorder or congenital degenerative collagen disease (e.g., Marfan's or Ehler's-Danlos Syndrome);
- Require bilateral exclusion of hypogastric blood flow;
- Have baseline serum creatinine level of > 2.5 mg/dl;
- Have other medical, social or psychological conditions that preclude them from receiving the pre-treatment, required treatment, and post-treatment procedures and evaluations.

This device is not recommended in patients who:

- have or are suspected of having an active systemic infection;
- cannot tolerate imaging contrast agents or have sensitivities or allergies to the stent graft system materials, antiplatelets or anticoagulants;
- have unstable angina;
- have had a myocardial infarction (MI) or cerebral vascular accident (CVA) within 6 months prior to implantation;
- exceed weight and/or size limits necessary to meet institution-defined imaging requirements

2.3 Contraindications and/or limitations

Contraindications

Patients with a systemic infection who may be at increased risk of endovascular graft infection.

Patients with known sensitivities or allergies to polyester, nitinol, tantalum, or polyethylene.

3. Device description

3.1 Description of the device

Stent grafts are devices known to medicine as wire supported conduits of artificial graft material and are principally used to exclude weakened, aneurysmal parts of the vasculature from the normal circulation.

The Aorfix™ AAA Endovascular Stent Graft is an AAA Flexible Stent Graft System for treating infra-renal aortic and aorto-iliac aneurysms. When placed within the aneurysm, the AAA (Abdominal Aortic Aneurysm) flexible stent graft system creates an internal bypass of the aneurysm to reduce the risk of rupture. Aorfix™ AAA Endovascular Stent Graft is a modular system where each component comprises: an implantable stent graft (Aorfix™ Stent Graft) and a disposable delivery system (IntelliFlex™ Low Profile Delivery System). The stent graft is a two-piece system consisting of:

- main body incorporating an ipsilateral leg component, and a contralateral socket, and
- contralateral plug-in leg.

The Aorfix™ main body has four sets of hooks. The contralateral socket is a standard 12mm diameter component, with an oblique distal end that is designed to assist cannulation with a guide-wire. Radiopaque markers made of tantalum wire rings are located at the open ends of graft components. A bifurcated main body implant, with contralateral leg.

Distal and proximal extension stent graft implants are available and may be used as required. The delivery systems for the proximal extender are the same as the main body delivery system while the delivery systems for the distal extenders are the same as the contralateral leg delivery system.

Each implant has a dedicated delivery system (18Fr ID main body and 16Fr ID contralateral leg). The delivery systems are designed to provide accurate placement of each implant and can be used by a single operator.

Nitinol (nickel / titanium alloy) is used for all stent and hook components, tantalum is used for all radiopaque markers and polyester is used for the graft and suture materials.

3.2 A reference to previous generation(s) or variants if such exist, and a description of the differences

Aorfix is currently at Generation IV design.

Device generations	**Date**
Uni-iliac device range (Gen I).	23 October 2001
Bifurcated device range (Gen II).	18 November 2004
A12-22 Aorfix™ AAA Stent Graft with Aorflex™ Delivery System, Main Body,	27 January 2012

Proximal Extender and converter devices only (Gen III)	
Approval of Intelliflex™ Delivery System (Gen IV)	06 June 2016

3.3 Description of any accessories which are intended to be used in combination with the device

Required Materials
Lombard AAA Flexible Stent Graft System Bifurcated Main Body preloaded in IntelliFlex Low Profile Delivery System
Lombard AAA Flexible Stent Graft System Contralateral Leg preloaded in IntelliFlex Low Profile Delivery System
Imaging equipment with capability to record and recall all imaging
Imaging table, or operating room table designed for use with C-arm
Fixed or mobile C-arm with vascular software
Appropriate personal protection equipment for Fluoroscopy
Angiography and exchange catheters
Assortment of adequate sizes (0.035" compatible) and assorted lengths
Guidewires: Assorted sizes of clinician's preference, 0.035" compatible, 180cm compatible
Contrast media
Heparinized saline and flushing syringes
Oversized moulding balloon
Introducer sheath for balloon
Vascular instruments and supplies **Caution:** Use of a stent material other than Nitinol may increase the risk of corrosion arising from dissimilar metals.

3.4 Description of any other devices and products which are intended to be used in combination with the device

Recommended Materials
Lombard AAA Flexible Stent Graft System Distal Extenders (2) preloaded in IntelliFlex Low Profile Delivery System
Lombard AAA Flexible Stent Graft System Proximal Extender preloaded in IntelliFlex Low Profile Delivery System
Contralateral iliac occluder and cross-over graft
Power injector with associated supplies
Snare
Serial dilators
Non-compliant balloons for treatment of and equivalent size to the distal iliac diameter;
Compliant and non-compliant balloons for treatment of, and equivalent size to, the aortic diameter.
Range of sizes self-expanding and balloon-expandable stents, including aortic sizes.
Embolization devices such as coils

4. Risks and warnings

4.1 Residual risks and undesirable effects

Adverse events that may occur and/or require intervention include, but are not limited to:

- Adverse reaction to device materials
- Infection, for example urinary tract, systemic or localized, endograft, sepsis;
- Loss of stent graft function arising from, for example, improper component placement or deployment, component migration, occlusion, infection, loss of integrity requiring surgical revision, perforation and endoleak;
- Endovascular or surgical reintervention to correct deficit caused by, or loss of performance of, stent graft including surgical conversion to open repair;
- Complications usually associated with endovascular procedures and percutaneous access including:
    - Insertion and other vascular access site complications for example infection, dissection, bleeding, pain, delayed healing, haematoma, dehiscence, seroma, cellulitis, nerve injury/damage, arteriovenous fistula;
    - Vessel damage, for example, dissection, plaque disruption, rupture, thrombosis, occlusion and fistulae.
    - Embolic and thrombotic events (with transient or permanent ischemia or infarction), for example, deep vein thrombosis, renal embolism, micro embolic shower;
    - Allergic reaction and/or anaphylactic response for example to x–ray contrast dye, anti-platelet therapy;
    - Blood or bleeding events for example hemorrhage, anemia, gastrointestinal bleeding, coagulopathy;
    - Arterial fistulae with, for example, vein, lymphatic, bowel;
    - Generalized inflammatory response, for example, elevated temperature (post implantation syndrome);
    - Ischemic losses arising from, for example, planned or inadvertent occlusion of branch vessels including complications to systems such as: hepatic, gastric, splenic, bowel, neurologic, genitourinary and musculoskeletal;
    - Hepatic failure;
    - Bowel events for example bowel ischemia, paralytic or adynamic ileus, obstruction, fistulae;
    - Cardiac events consequent to general anesthesia and abdominal surgery and, for example, transient aortic occlusion during ballooning;
    - Death
    - Lymphatic complications and subsequent attendant problems, for example, lymphocele, lymphatic fistula;
    - Multi-system organ failure;
    - Neurologic or cerebral events and subsequent attendant problems, for example, transient ischemic attacks, cerebrovascular accident (hemorrhagic or embolic), reversible ischemic neurologic deficit, nerve injury, paraparesis and paraplegia;
    - Pulmonary events consequent to general anesthesia and abdominal surgery;
    - Renal complications, for example, acute and chronic renal failure, renal microembolism, renal insufficiency, renal artery occlusion, contrast toxicity;
    - Impotence/ sexual dysfunction;
    - Shock.

4.2 Warning and precautions

General

- The Aorfix AAA Endovascular Stent Graft is for single patient use only. Do not reuse, reprocess or re-sterilize. Reuse, reprocessing or re-sterilization may compromise the structural integrity of the device and/or lead to device failure that may result in patient injury, illness or death. Reuse, reprocessing or re-sterilization may also create a risk of contamination of the device and/or cause patient infection, including, but not limited to, the transmission of infectious disease(s) from one patient to another. Contamination of the device may lead to injury, illness or death of the patient.
- A conical or trapezoidal neck involving a diameter change of 5mm or more over its 15mm length or selection of a proximal landing zone 8mm or more distal to the distal renal artery may increase the risk of migration. More frequent imaging follow-up should be considered for such patients.
- A substantial calcified plaque on a sharp, angled transition from neck to aneurysm sac has been seen to perforate the fabric of the graft in one subject in the PMA study and an additional patient in global experience. More frequent imaging follow-up should be considered for such patients.
- Accurate fluoroscopic imaging is required during any endovascular procedure and for proper device deployment. Implantation of this device should occur in an operating room, endovascular suite, catheterization laboratory, or similar sterile environment, with appropriately trained personnel, and suitable equipment and imaging capabilities.
- Do not use this device if the patient is unable to be evaluated using the necessary preoperative and postoperative imaging.
- Always have a qualified surgery team available during implantation or re-intervention procedures in the event that conversion to open surgical repair is necessary.
- The Aorfix™ AAA Stent Graft should only be used by clinicians and teams experienced in endovascular techniques, and who have been trained in its use.
- The long-term performance of this implant has not been established. All patients treated with this device must undergo periodic imaging to evaluate stent graft integrity and position, aneurysm size, and potential endoleaks and/or, occlusion of vessels in the treatment area. Significant aneurysm enlargement, a persistent endoleak, the appearance of a new endoleak, device migration, reduced blood flow through the graft, and/or decrease in renal function due to renal artery occlusion should prompt further investigation into the need for further patient treatment, including additional intervention or surgical conversion. Additional patient imaging follow-up should be considered for patients with devices that have effectiveness issues.
- All patients should be carefully counselled on the need for long-term follow-up. The device is not recommended in patients unable or unwilling to comply with the information in Follow-up Imaging Recommendations.

Patient and Device Selection

Inappropriate patient or device selection may result in poor device performance. Patients should be assessed for suitability by the prescribing clinician who should take into account their knowledge of AAA surgery and Endovascular Aneurysm Repair (EVAR) including but not limited to the list below:

- Access vessel diameter, vessel morphology and delivery system diameter should be compatible with vascular access techniques (femoral cut down or percutaneous). Vessels that are significantly calcified, occlusive, tortuous or thrombus-lined may preclude placement of the device or pose a risk of increased device complications. In patients with narrow access vessels, careful use of dilation, stenting or iliac conduits may allow introduction of the device.
- Key anatomic elements that may affect exclusion of the aneurysm include very severe proximal neck angulation (>90°), short proximal aortic neck (< 15mm center-line length), distal iliac landing zone < 15mm, and inappropriate diameter selection for the intended landing zones.
- Aortic necks with angles ≥60° may dilate substantially within 12 months' dependent upon the extent of disease. Use adequate device over-sizing and note that close surveillance during follow-ups is necessary in these cases.

- In aortic necks with angles ≥60° there is an increased risk of the proximal end landing obliquely. Ensure the stent graft is appropriately oversized.
- Aortic necks that dilate by 5mm or more over their 15mm length have been associated with increased rates of migration. In four PMA study subjects suffering migration, the diameters of the necks increased by more than 5mm over their 15mm length. In two of these four cases grafts were also landed at least 8mm below the distal renal arteries.
- Aortic necks where the anatomy only forms a suitable landing zone of 8mm or more distal to the distal renal artery have been associated with increased rates of migration.
- The presence of calcified plaques in the aortic neck, particularly those that line the transition between the bottom of the neck and the aneurysm sac, has caused wear leading to a late Type III endoleak in one subject in the PMA study and one further patient in global experience.
- In aortic necks with angles ≥60° plan for ipsilateral to be the side where the delivery system encounters fewer changes in direction during insertion.
- Irregular calcification, plaque or thrombus may compromise the fixation and/or sealing at the implantation sites.
- Placement of the implant in an aorta with a diameter of 18mm or less in the region of the gate can result in occlusion of the ipsilateral limb.
- The Aorfix™ AAA Endovascular Stent Graft has not been evaluated in patients who:
  - Are pregnant or nursing; o Are less than 21 years old;
  - Have traumatic aortic injury, ruptured aneurysms, aneurysms pending rupture or require other emergent aorta or aneurysm treatment;
  - Have thoraco-abdominal, suprarenal or abdominal aneurysms where there is no infrarenal neck or have ilio-femoral, mycotic, inflammatory, dissecting or pseudo-aneurysms; o Have hypercoagulability, bleeding diathesis or coagulopathy;
  - Have mesenteric or celiac artery occlusive disease, giving rise to a dominant patent inferior mesenteric artery; o Have connective tissue disorder or congenital degenerative collagen disease (e.g., Marfan's or Ehler's-Danlos Syndrome); o Require bilateral exclusion of hypogastric blood flow;
  - Have baseline serum creatinine level of > 2.5 mg/dl; o Have other medical, social or psychological conditions that preclude them from receiving the pre-treatment, required treatment, and post-treatment procedures and evaluations.
- This device is not recommended in patients who: have or are suspected of having an active systemic infection; cannot tolerate imaging contrast agents, or have sensitivities or allergies to the stent graft system materials, antiplatelets or anticoagulants; have unstable angina; have had a myocardial infarction (MI) or cerebral vascular accident (CVA) within 6 months prior to implantation; or exceed weight and/or size limits necessary to meet institution-defined imaging requirements.

Implant Procedure

- Refer to Section 11 for warnings and cautions specific to the implant steps of the Aorfix AAA Endovascular Stent Graft.
- Pre-operative planning for access and placement should be performed before opening the device packaging.
- Ensure that all stent graft components potentially required are available before starting the procedure.
- Renal complications may occur:
  - from an excess use of contrast agents o as a result of embolic shower o from misplaced stent graft
- Ensure that the fishmouth is correctly orientated with respect to the renal arteries to avoid their inadvertent occlusion. Correctly identify the orientation of the fishmouth through the sheath of the graft before introduction into the patient.

- Ensure that the anterior peak of the fishmouth does not impinge or occlude the superior mesenteric artery. Plan to deploy within 8mm of the distal renal artery. Landing more distally has been associated with increased risk of migration. In four subjects suffering migration, grafts were landed at least 8mm below the distal renal arteries. In two of these four cases, the diameters of the necks also increased by more than 5mm over their 15mm length.
- The patient's blood pressure can push the delivery system back through the access vessels unless it is held in place.
- Failure to operate the Y-mechanism collapse control may result in displacement of the graft during removal of the delivery system.
- Carefully inspect the device packaging and device for damage or defects prior to use. If signs of damage or defects exist or if premature breach of the sterile barrier is observed, do not use the device.
- Minimize handling of the delivery system during preparation and insertion to decrease the risk of contamination and infection.
- Do not re-sterilize any components of the Aorfix™ AAA Endovascular Stent Graft.
- Systemic anticoagulation should be used during the implantation procedure, based on hospital or clinician protocol. If heparin is contraindicated, an alternative anticoagulant should be considered.
- Over-lengthy occlusion of the ipsilateral vessels, particularly with light systemic anticoagulation can result in vessel occlusion.
- Use fluoroscopic guidance to advance the delivery system and to detect kinking or alignment problems with the stent graft components.
- Exercise care in handling and delivery techniques to help prevent vessel rupture.
- Exercise particular care in difficult areas, such as areas of stenosis, intravascular thrombosis, or in calcified or tortuous vessels. Consider performing serial dilatation or balloon angioplasty at the site of a narrowed or stenotic vessel, and then attempt gently to reintroduce the delivery system.
- If the sheath is accidentally withdrawn, the implant will prematurely deploy and may be incorrectly positioned.
- Use magnification when visualising the renal landing zone to improve accuracy of placement.
- Inaccurate placement or an inadequate seal zone may result in an increased risk of leakage into the aneurysm or migration of the stent graft.
- Do not use excessive force to advance or withdraw the delivery system when resistance is encountered. If the delivery system kinks during insertion, do not attempt to deploy the stent graft component; remove the device and replace it with a new one.
- Stent graft components cannot be replaced or drawn back into the delivery system, even if the stent graft component is only partially deployed.
- Inadvertent partial deployment or migration of the stent graft may require surgical removal or repair.
- Use of a non-stiff guidewire may result in an inability to navigate the vasculature. In tortuous vessels, this can lead to rupture.
- The deployment plan should not expect an angled neck to straighten by the use of a stiff guidewire.
- Initiate deployment of the proximal end of the stent graft in the straight section of the aorta slightly above the renals and pull the delivery system distally as the fishmouth opens.
- Deploy the stent graft at a slow pace continuously observing the position of the proximal end of the stent graft.
- Do not rely on a 'road-map' image remaining accurate throughout deployment. Revisualise anatomic landmarks, such as the renal arteries, at frequent intervals during deployment.
- Do not manipulate the proximal part of the graft after the fishmouth is deployed

- High pressure injections of contrast media made at the edges of the stent graft immediately after implantation may cause endoleak.
- Confirm cannulation of the aortic body contralateral lumen to ensure accurate placement of the contralateral leg.
- After cannulation, take care not to insert the guidewire between the stent graft fabric and a suture or wire support otherwise the leg delivery system may push the stent graft proximally.
- The position of the proximal end of the implant is not considered fixed until the hooks have been engaged after ballooning. Take care to ensure that the proximal end of the implant is not displaced.
- As a result of the fishmouth shape at the proximal end of the stent graft, it is necessary to balloon parts of the aorta that are not completely covered by the stent graft. When a balloon catheter is used, do not inflate to greater than the diameter of the aorta. Do not balloon completely outside the stent graft. Be aware that vessel rupture can occur even when the balloon is fully within the graft. Follow all manufacturer instructions regarding catheter operation.
- Any endoleak left untreated during the implantation procedure must be carefully monitored after implantation.
- When deploying the stent graft, be sure to hold the handle of the delivery system stationary.
- Take extra care in angulated necks not to displace the implant when withdrawing the delivery system.
- Failure to dilate fully the proximal end of a distal extender can result in limb occlusion.
- Use of a distal extender in a leg which has a smaller diameter than the distal extender can result in stenosis or occlusion.
- Insertion of a distal extender with more than 20mm overlap into a leg graft risks compressing the proximal part of the extender with the tapered part of the leg graft. This can lead to stenosis or occlusion.
- When deploying the proximal cuff, ensure that its orientation and axial position are carefully controlled to avoid encroachment or covering the renal arteries.
- The proximal extender is short, and deploys quickly. Ensure full planning has taken place before deployment.
- When deploying the proximal extender, it is essential that the extension distance is measured apex to apex rather than trough to trough. This is because the troughs of the extender move slightly proximally during final ballooning.
- Use of a stent material other than Nitinol may increase the risk of corrosion arising from dissimilar metals.
- Patients who experience hypersensitivity reactions during the procedure should be managed in accordance with standard recommendations for treatment of patients with radiocontrast agent allergies (e.g., antihistamines, corticosteroids, adrenaline).

Use of Exchange Sheaths

- Before withdrawing or inserting the sheath through tortuous anatomy, insert the dilator through the sheath to avoid vessel damage or possible kinking.
- Ensure that the correctly sized supplied dilator is used when advancing the sheath into the patient.
- Ensure that the lumen of the exchange sheath is large enough to allow passage of instruments or catheters through its lumen.
- Instruments or catheters used with the exchange sheath should move firmly but smoothly through the valve and sheath. The valve can be damaged or cause damage to instruments or catheters if too tight a fit.
- When inserting, manipulating or withdrawing a device through an exchange sheath, always stabilize the position of the exchange sheath.

- The exchange sheath can be pushed out of the patient by blood pressure if it is not stabilised.
- Before removing or inserting devices through the exchange sheath, aspirate through the flushing port to clear the lumen, then flush with heparinized saline.
- Note that the exchange sheath cannot be flushed when the dilator is in place.
- Take care when passing the dilator tip through the hemostatic valve to avoid damaging the valve. If the dilator does not pass smoothly, reposition the tip and try again.
- When inflating a balloon at, or close to, the tip of the sheath, ensure no part of the balloon is inside the sheath.
- When puncturing, suturing or incising the tissue near the exchange sheath, use caution to avoid damaging the sheath.
- Do not attempt to insert or withdraw the guidewire or introducer if resistance is felt.
- When a leg delivery system is used in combination with main body or proximal cuff exchange sheath, ensure that the sheath of the leg delivery system projects through the tip of the larger size exchange sheath. This is achieved when the hub of the delivery system is in contact with the hemostatic valve of the exchange sheath.

Follow-Up Imaging

Patients with particularly challenging anatomy, including those with aortic neck anatomy that lies outside the indications of this IFU, patients with trapezoidal necks with a diameter change of 5mm or more over 15mm, those in whom the proximal landing zone could not be juxta-renal, particularly if the lowest part of the fishmouth is 8mm or more distal to the distal renal artery, those with high levels of calcified plaque at the transition of the aortic neck to the aneurysm sac and those in whom barb fracture has been detected should be followed diligently with consideration given to more frequent follow-up. Late migration, sac expansion, aneurysm rupture and fracture have occurred in such patients.

4.3 Other relevant aspects of safety, including a summary of any field safety corrective action (FSCA including FSN) if applicable

N/A

5. Summary of clinical evaluation and post-market clinical follow-up (PMCF)

5.1 Summary of clinical data related to equivalent device, if applicable

N/A – Aorfix does not claim equivalence to any other devices.

5.2 Summary of clinical data from conducted investigations of the device

First In Man

Aorfix was the subject of a premarket trial supporting market approval in the United States. Patients were recruited from 2006 to 2011 and significant data is available on follow-up out to five-years.

The patient population in the trial is equivalent to the anticipated EU patient population, as the trial enrolled some subjects from the EU as well as the US. The United States population is comprised of a diverse ethnic population which includes ancestral origins to the EU.

PYTHAGORAS – The PYTHAGORAS IDE trial is a non-randomized, multicenter trial evaluating the use of Aorfix™ in the treatment of abdominal aortic aneurysms, aorto-iliac aneurysms, and common iliac aneurysms where the anatomy is highly tortuous. The trial was a controlled, prospective, nonrandomized and multicenter. The trial protocol allows patient enrollment with proximal neck angles up to 90º. A total of 45 sites in the US, Canada, and Poland enrolled 218 patients. Following enrollment, patients underwent clinical and imaging follow-up at 30 days, 6

months, 12 months, and annually thereafter to five years. An independent imaging core laboratory, M2S (West Lebanon, NH), provided review of study imaging (CTs, x-rays). A Data Monitoring Committee reviewed and adjudicated all safety events. Patient follow-up is ongoing and will continue until each patient reaches their protocol defined, 5-year evaluation or leaves the study (withdrawal, death, lost-to-follow-up). Patient enrollment concluded on 30 September 2011. This update includes data received as of 3 January 2017.

Continued Access - To provide access for patients requiring treatment for high angle aneurysms while FDA reviewed the PMA, a Continued Access program was created and approved by FDA. Sixteen of the existing PYTHAGORAS sites participated in the Continued Access program, enrolling a total of 12 patients from April 2012 to February 2013. Continued Access patient enrollment ended on 14 February 2013 when FDA approved the Aorfix™ PMA. As with the IDE trial, all patients enrolled in the Continued Access program have the same 5-year follow-up evaluations.

All-cause mortality

Mortality*	**At 30 Months N=230**	**At 12 Months N=230**	**At 24 Months N=230**	**At 36 Months N=230**	**At 48 Months N=230**	**At 60 Months N=230**
Death (All-Cause) N, Cumulative	4	16	30	44	56	69

Aneurysm ruptures

Rupture*	**0-12 Months N=230**	**12-24 Months N=230**	**24-36 Months N=230**	**36-48 Months N=230**	**48-60 Months N=230**
Aneurysm Rupture	3	0	2	0	0

Endoleaks

	30 days	**6 months**	**6m to 1 year**	**1 to 2 years**	**2 to 3 years**	**3 to 4 years**	**4 to 5 years**
Number of subjects with adequate imaging to assess endoleak	**174**	**107[1]**	**159**	**137**	**123**	**96**	**86**
Type Ia							

New	3	0	4[4]	0	3[5]	0	0
Persistent	0	1	1	0	0	1	0
Total (new + persistent	3 (1.7%)	1 (0.9%)	5 (3.1%)	0 (0.0%)	3 (2.4%)	1 (1%)	0 (0.0%)
Type Ib							
New	1[7]	0	0	0	0	0	0
Persistent	0	0	0	0	0	0	0
Total (new + persistent)	1 (0.6%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Type II							
New	48	10	12	4	4	5	4
Persistent	0	27	28	24	13	7	6
Total (new + persistent)	48 (27.6%)	37 (34.6%)	40 (25.2%)	28 (20.4%)	17 (13.8%)	12 (12.5%)	10 (11.6%)
Type III							
New	0	1	0	0	1[8]	0	0
Persistent	0	0	1	0	0	0	0
Total (new + persistent)	0 (0.0%)	1 (0.9%)	1 (0.6%)	0 (0.0%)	1 (0.8%)	0 (0.0%)	0 (0.0%)
Type not identified							
New	6[2]	4[3]	3	6	6[6]	6	1
Persistent	0	1	2	2	2	4[6]	6
Total (new + persistent)	6 (3.4%)	5 (4.7%)	5 (3.1%)	8 (5.8%)	8.1%)	10.4%	7 (8.1%)

Aneurysmal sac change

	30-day	**6 month**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
Total evaluable	185	115[1]	185	164	146	118	108
Baseline	185	18	11	1	0	0	0

New expansion		1	1	10	8	4	9
persistent expansion		-	1	1	3	8	7
Total growth (new + persistent)		1 (1%)	2 (1%)	11 (7%)	11 (8%)	12 (10%)	16 (15%)
New stability	185	95	104	8	5	8	4
persistent stability		-	-	54	46	36	25
Total stability (new + persistent)	185 (100%)	95 (82%)	104 (56%)	62 (38%)	51 (35%)	44 (37%)	29 (27%)
New shrinkage		20	79	29	6	1	6
persistent shrinkage		-	-	62	78	61	57
Total shrinkage (new + persistent)		20 (17%)	79 (43%)	91 (55%)	84 (58%)	62 (53%)	63 (58%)
Total stable or shrinkage (new + persistent)	185 (100%)	115 (99%)	183 (99%)	153 (93%)	135 (92%)	106 (90%)	92 (85%)

Freedom from migration

	To 30 days	**31-365 days**	**183-365 days**	**1-2 years**	**2-3 years**	**3-4 years**	**4-5 years**
No. at Risk[1]	230	223	216	205	182	154	124
No. Censored[2]	7	7	10	21	26	28	57
No. of Events	0	0	1	2	2	2	0
KM Estimate[3]	1	1	0.995	0.985	0.974	0.960	0.960

Error	0	0	0.005	0.009	0.012	0.015	0.015

Fractures

Barbs	**30 -Day**	**6 Month**	**1 Year**	**2 Year**	**3 Year**	**4 Year**	**5 Year**
New fracture	0 (0%)	4 (2%)	7 (4%)	12 (9%)	12 (9%)	9 (9%)	5 (7%)
Previously observed	0 (0%)	0 (0%)	2 (1%)	5 (4%)	12 (9%)	11 (11%)	12 (16%)
All fractures	0 (0%)	4 (2%)	9 (5%)	17 (12%)	24 (18%)	20 (20%)	17 (23%)
No fracture	175 (100%)	169 (98%)	164 (95%)	121 (88%)	111 (82%)	78 (80%)	57 (77%)

Main Bodies	**30 Day**	**6 Month**	**1 Year**	**2 Year**	**3 Year**	**4 Year**	**5 Year**
New fracture	1 (1%)	1 (1%)	0 (0%)	0 (0%)	0 (0%)	1 (1%)	0 (0%)
Previously observed fracture	0 (0%)	1 (1%)	2 (1%)	2 (1%)	1 (1%)	1 (1%)	2 (3%)
All fractures	1 (1%)	2 (1%)	2 (1%)	2 (1%)	1 (1%)	2 (2%)	2 (3%)
No fracture	174 (99%)	171 (99%)	171 (99%)	136 (99%)	134 (99%)	96 (98%)	72 (97%)

Freedom from graft occlusion

	To 30 days	31-365 days	183-365 days	1-2 years	2-3 years	3-4 years	4-5 years
No. at Risk[1]	230	216	210	199	178	149	120
No. Censored[2]	7	6	10	21	29	29	60
No. of Events	7	0	1	0	0	0	0
KM Estimate[3]	0.969	0.969	0.964	0.964	0.964	0.964	0.964
Error	0.012	0.012	0.012	0.012	0.012	0.012	0.012

Major adverse events through 5 years

SAE Category [n (n/N%)]	**Aorfix**					
	30 Days (N=230)	**1 Year (N=230)**	**2 Years (N=230)**	**3 Years (N=230)**	**4 Years (N=230)**	**5 Years (N=230)**
Aneurysm Rupture	1 (0.4%)	2 (0.9%)	2 (0.9%)	4 (1.7%)	4 (1.7%)	4 (1.7%)
Bowel Ischemia	1 (0.4%)	2 (0.9%)	2 (0.9%)	3 (1.3%)	3 (1.3%)	3 (1.3%)

Cardiac Arrest	1 (0.4%)	2 (0.9%)	3 (1.3%)	5 (2.2%)	9 (3.9%)	9 (3.9%)
Congestive Heart Failure	7 (3.0%)	11 (4.8%)	12 (5.2%)	14 (6.1%)	17 (7.4%)	18 (7.8%)
Excessive Bleeding	29 (12.6%)	29 (12.6%)	29 (12.6%)	29 (12.6%)	29 (12.6%)	29 (12.6%)
Graft Occlusion	7 (3.0%)	8(3.5%)	8(3.5%)	8(3.5%)	8(3.5%)	8(3.5%)
Graft Thrombosis	3 (1.3%)	5 (2.2%)	6 (2.6%)	6 (2.6%)	6 (2.6%)	6 (2.6%)
Myocardial Infarction	4 (1.7%)	9(3.9%)	11 (4.8%)	12 (5.2%)	12 (5.2%)	15 (6.5%)
Need for Device Replacement or	6 (2.6%)	11 (4.8%)	13 (5.7%)	17 (7.4%)	24 (10.4%)	32 (13.9%)
Pulmonary Failure Requiring Intubation	3 (1.3%)	5 (2.2%)	5 (2.2%)	5 (2.2%)	6 (2.6%)	6 (2.6%)
Renal Failure Requiring	2 (0.9%)	3 (1.3%)	3 (1.3%)	3 (1.3%)	4 (1.7%)	4 (1.7%)
Sepsis	1 (0.4%)	2 (0.9%)	4 (1.7%)	6 (2.6%)	7 (3.0%)	7 (3.0%)
Surgical Wound Complic ation	9 (3.9%)	12 (5.2%)	13 (5.7%)	14 (6.1%)	17 (7.4%)	17 (7.4%)

Study conclusions

The information provided is adequate to provide a reasonable assurance of the effectiveness of the Aorfix for the treatment of abdominal and aorto-iliac aneurysms with necks up to 90°.

The clinical study was performed in a uniquely challenging subject population in which approximately 70% had aortic neck angulations greater than 60° and more than 28% of subjects were female. The ability to treat such high neck angulation services the need of all patients with neck angles greater than 60° and is of particular value to female patients with aortic aneurysms, who are known to have a higher propensity for greater neck angulation than their male counterparts.

The data support the reasonable assurance of safety and effectiveness of this device when used in accordance with the indications for use. As expected, there were slightly higher rates of adverse events in subjects with highly angled aortic necks. The risks associated with these events can be diminished with adequate subject selection and follow-up.

VQI

A Post Market Surveillance (PMS) protocol based on the SVS Vascular Quality Initiative (VQI) was initiated in July 2014. The study is based in the US only and provides data on the commercial use of Aorfix. 42 patients were included in the study.

All-cause mortality

Subject Number	Mortality Event	Related to Disease or Treatment?	Summary Narrative
271549	< 1 year	No	No endoleak detected. No recorded complication or re-intervention.

239908	1 year	No	No endoleak detected. No recorded complication or re-intervention.
252682	1 year	No	Re-intervention to treat Type Ib endoleak with competitor graft landing in common iliac artery. Patient passed 38 days post revision
222177	2 year	No	No endoleak detected. No recorded complication or re-intervention.
239909	2 year	No	Persistent Type Ia endoleak, treated at 12/12 with competitor cuff. R renal artery occlusion, creatinine ≤0.9mg/dl, Type Ia persisted. Full graft revision, patient passed 46 days post revision.
240116	2 year	No	Type II endoleak at 30 days. No recorded complication or re- intervention.
257138	2 year	No	No endoleak detected. No recorded complication or re-intervention.

Secondary interventions

Device-Related Secondary Procedures[1]	**Aorfix™ n/N=42 (%)**
Subjects with procedure at 30 Days	0/32 (0.0%)
Subjects with procedure at 1 Year	5/37 (14%)
Subjects with procedure at 2 Years	2/33 (6%)
Subjects with procedure at 3 Years	0/5

Endoleaks

Endoleak n Leaks (n/N%)	**At 30 Days**	**At 1 Year**	**At 2 Years**	**At 3 Years**
New Type Ia	1 (3.2%)	-	1 (3.2%)	-
Existing Type Ia	-	1 (2.8%)	-	-
Total Type Ia	1 (3.2%)	1 (2.8%)	1 (3.2%)	-
	-	-	-	-
New Type Ib	-	2 (5.6%)	-	-
Existing Type Ib	-	-	-	-
Total Type Ib	-	2 (5.6%)	-	-
	-	-	-	-
New Type II	10 (32.3%)	3 (8.3%)	1 (3.2%)	-
Existing Type II	-	6 (16.7%)	4 (12.9%)	-
Total Type II	10 (32.3%)	9 (25.0%)	5 (16.1%)	-
	-	-	-	-
New Type III	-	1 (2.8%)	-	-

Existing Type III	-	-	-	-
Total Type III	-	1 (2.8%)	-	-
	-	-	-	-
New Type IV	-	-	-	-
Existing Type IV	-	-	-	-
Total Type IV	-	-	-	-
	-	-	-	-
New Unidentified	1 (3.2%)	2 (5.6%)	2 (6.5%)	-
Existing Unidentified	-	-	-	-
Total Unidentified	1 (3.2%)	2 (5.6%)	2 (6.5%)	-

Change in aneurysmal sac size

Change in Aneurysm Diameter (mm)	**Mean ± STD Range**	
	Increase >5mm	**Decrease<-5mm**
30 Days	N=29 1	N=29 0
1 Year	N=15 2 (13.3%)	N=15 4 (26.7%)
2 Years	N=10 5	N=10 4
3 Years	N=0	N=0
Change in Aneurysm Volume (mL)	**Increase >5%**	**Decrease<-5%**
30 Days	N=29 12 (41.4%)	N=29 1
1 Year	N=15 4 (26.7%)	N=15 7 (46.7%)
2 Years	N=10 5 (50.0%)	N=10 5 (50.0%)
3 Years	N=0	N=0

Forty-two patients have been enrolled in the study and this limits the utility of the data provided. The results are consistent with those of the Pythagoras study and there is every indication that Aorfix performs with satisfactory safety and effectiveness in the commercial setting.

Norfolk and Norwich study

A retrospective analysis of all patients treated with the Aorfix AAA Endovascular Stent Graft at Norfolk and Norwich Hospital (single centre) between June 2007 and November 2017 was performed.

The aim of this study is to report the outcomes of the abdominal aortic aneurysm (AAA) repairs with the Aorfix stent-graft at our institution, with a median of five years follow up, assessing whether high neck angulation or iliac tortuosity affected rates of secondary intervention or aneurysm-related mortality.

127 patients were identified as having been treated with the Aorfix stent-graft on an elective basis over the study period. The mean age was 78 (range 63-94). The median AAA diameter was 60mm. Sixty-three patients were identified as having a neck angle of greater than 60 degrees (49%) with the

remaining 64 patients treated for iliac tortuosity or a combination of both (51%). The median neck angle in the highly angulated group was 79^{o}, compared to 21^{o} in the those with iliac tortuosity (p=0.001). The neck length was similar in each group at 29.8mm in the iliac tortuosity group versus 30.5mm (p=0.82). There were 29 patients who required an embolization procedure prior to EVAR (23%).

30-day outcomes

In this challenging series of patients, the 30-day mortality was 1.6%. The stent graft was successfully deployed in 98.4% of patients (125/127). In the first technical failure, it was not possible to advance the delivery system into place secondary to narrow iliac vessels, and the patient was converted to an aorto-uni-iliac device and with subsequent femoral-femoral bypass grafting performed because of limb compromise. The second patient was converted to open surgery following a human error in failing to follow the correct instructions for use steps to release the top end of the graft, prior to retrieval of the device. Of the two patients who died, both underwent post-mortem examinations performed by via the coroner's office; in both cases, cause of death was attributed to cardiac failure on a background of ischaemic heart disease, and not directly related to the recent aneurysm repair.

Twenty-three patients (18%) had extensions placed at the time of EVAR either due to the presence of an endoleak or lower than intended placement in the neck. This gave an initial primary technical success rate of 82%, but this rose to 95.3% after the use of additional device pieces. Only 4 patients had persistent type 1a endoleaks at the end of the procedure, despite supra-renal proximal extensions (Renu Cuff, Cook Medical, Bloomington, IN, USA) and further endovascular stent placement (Palmaz XL, Cordis, Miami lakes, FL, USA).

Long term clinical success

The patients were followed for up to 10 years. A total of 8 patients (6%) were lost to follow up during the follow up period. The median follow-up was 5 years in surviving patients. The one-year mortality was 7.9% (3 patients with angulated necks and 7 with iliac tortuosity, p=0.32). Kaplan-Meyer survival curves were constructed, and these showed a median survival of 7 years across the cohort.

Stable sac size or sac shrinkage (>5mm) was seen in 97 patients (76%). The sac diameter decreased in both groups over time, but more rapidly in the angulated neck group (-2.6mm/yr) relative to the change in those with a AAA and severe iliac disease (-0.93mm/yr) (p=0.44). Overall, freedom from secondary intervention was 91% at one year, 91% at two years, 86% at three years, 82% at four years and 77% at five years.

Endoleaks

Eight patients had sac expansion ≥5mm at one year (7.1%). Four patients had sac expansion in the presence of a persistent type 1a endoleaks. One patient's endoleak settled spontaneously but the other 3 patients had persistent endoleaks despite proximal extensions. These patients died prior to further planned intervention. 3 patients had persistent type 1b endoleaks. Two settled following distal limb extension, whilst 1 remains under surveillance.

Over the course of the study period, 43 patients had type II endoleaks (34%). Of these, 29 demonstrated a stable or shrinking aneurysm sac size on follow up imaging and are being managed conservatively. At a median follow up of 5 years, 14 patients had sac expansion in the presence of type 2 endoleaks (11%). 8 were treated conservatively. Three patients had the endoleak successfully treated with coil embolization. One patient was successfully treated with Onyx embolization. Two were treated successfully with direct sac puncture. One patient was deemed unfit for further

intervention and was discharged. One patient died prior to treatment.

Late aneurysm-related deaths

There was only one late aneurysm-related death. The patient presented with back pain and collapse to the A&E department 10 months after EVAR and CT confirmed aneurysm sac rupture. The CT scan performed 3 months earlier showed a 2mm increase in sac size compared to the pre-procedure CT and a type II endoleak. He was scheduled for routine follow-up and was due a further CT at 12 months. He was not fit for open surgery, but an attempt to embolize the endoleak endovascularly was made. Unfortunately, it was not possible to cannulate the sac via the SMA and the patient died.

Angulated necks vs. iliac tortuosity

A subset comparison of highly angulated patients versus tortuous iliac patients demonstrated no significant difference ($p > 0.05$) in patient age (76.0 vs. 77.9), number of pre-interventions (12/63 vs 17/64), or proximal extension (11/63 vs.12/64) – see Table 55. Across the long term follow up. there was no significant difference in freedom from endoleak when comparing the hostile neck anatomy group (77%) and the tortuous iliac group (64%) ($p=0.36$) and accordingly, f freedom from secondary intervention was not significant; 93% vs 89% at one year ($p=0.91$). Analysis of the survival curves for the 2 groups did not demonstrate any difference on Mantel-Cox log-rank testing ($p=0.64$).

Within the angulated neck group there was a subset of highly angulated necks (≥75o), which constituted 35/63 patients with angulated necks. Comparison between the angulated and highly angulated necks demonstrates that although the anatomy was much more challenging, the outcomes were at least as good for the highly angulated group. The median neck angle in the highly angulated neck group was 85o, as opposed to 66 o in the lower group ($p<0.001$). The median AAA diameter of the highly angulated group was 6mm larger at 66mm, and the median neck diameter was also larger (26mm v 22mm, $p=0.003$). The durability of repair was also unaffected by the angulation in these cases, with both groups showing an overall 8mm decrease in AAA diameter over 5 years ($p=0.95$). See Table 56 for further details. Five-year survival curves demonstrated no difference in long terms outcomes either ($p=0.36$).

Discussion

Hostile neck anatomy and tortuous iliac arteries are well recognised anatomical restrictions on the use of endovascular repair for repair for abdominal aortic aneurysms. Even during the early years of EVAR, it was quickly recognised that up to 47% of AAA patients had difficult iliac anatomy requiring particular attention (11). The EUROSTAR registry (n=5183) demonstrated that use of devices outside of their IFU, in terms of severe neck angulation (>60o), increased the risk of proximal neck dilatation, type 1 endoleaks (HR 2.3, $p<0.001$) and a 29% increase in the rate of secondary intervention (1). Similar outcomes were noted in the landmark Schanzer paper (n=10,228), where use of EVAR in patients with neck angulation >60o was associated with a 96% increase in the risk of aortic sac enlargement (12). The Aorfix stent graft (Lombard) was designed specifically to overcome the issues caused by highly angulated necks and tortuous iliacs (7). The Arbiter 2 study assessing the outcome and safety of Aorfix for use un aneurysms with highly angulated necks demonstrated a high primary technical success rate (93%) with only 2 Type 1 endoleaks at 6 months and no device related secondary interventions in a small cohort of 24 patients (6). An Italian study also showed good outcomes in a very challenging series of patients, where the median neck angle was 87.5o (13).

The PYTHAGORAS trial was specifically designed to study the performance of Aorfix in challenging aortic anatomy. The trial enrolled 218 patients, with 67 patients in the standard-angle neck group and 151 patients in the highly angulated neck group. It demonstrated that the 5-year results showed no type I or type III endoleak in either group, no differences in migration or sac expansion between

the 2 groups (P ≥ 0.27). The 5-year freedom from all-cause mortality was 73% in the standard angulated group vs 68% in highly angulated group (p = 0.43), with similar figures for aneurysm-related mortality (99% vs 95%; p=0.44); from aneurysm rupture (99% vs 99% p=1.0); and from device-related secondary intervention (88% vs 80% p=0.18). (14).

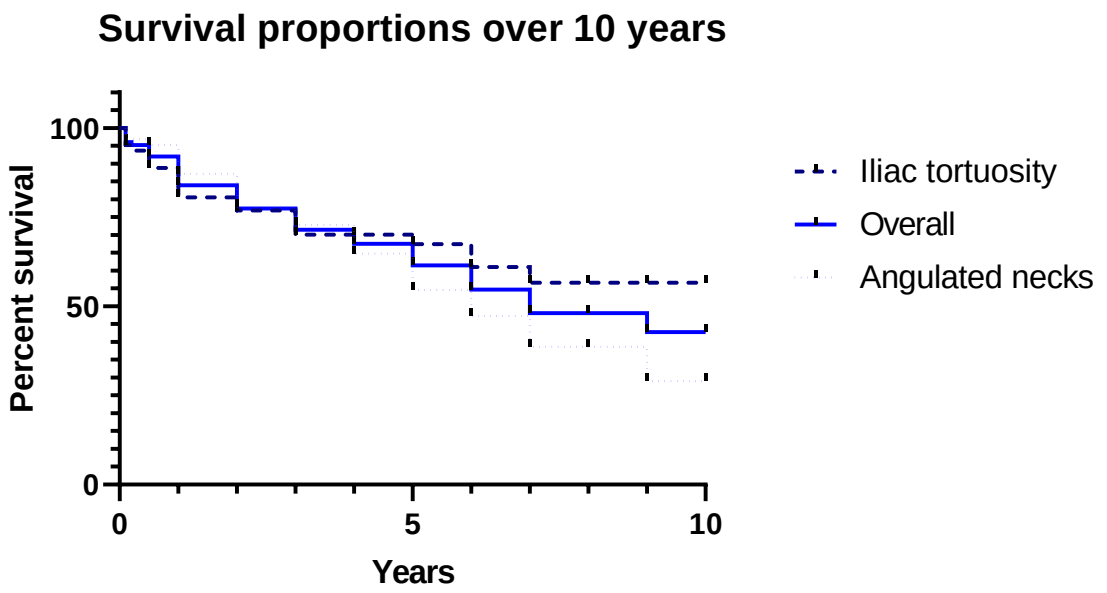
The Aorfix stent-graft system was one of a number of EVAR solutions available in our vascular unit through the duration of the study period. We chose to utilise the Aorfix device as because its unique construction imbued it with a very high degree of flexibility, making it ideally suitable for tortuous iliac vessels, and importantly it allowed us to use a device within its IFU for cases with angulated necks. Despite its use in the most challenging of our cases, the Aorfix stent graft had an assisted primary technical success rate of 95.3% which compares well with previously published data (6, 13). After a median follow up of 5 years follow up, there was a high clinical success rate with 76% of patients showing a stable or decreasing aneurysm sac size. This is slightly lower than the PYTHAGORAS trial which had 12% sac expansion at 5 years, but the freedom from secondary interventions is similar at 83% versus 77% in our current study.

The subset analysis between the highly angulated necks and the iliac tortuosity demonstrated that there was no significant difference between the number of proximal extensions used between the groups suggesting that the rate of proximal extension is at least in part due to the learning curve, rather than difficulties in deploying in angulated necks. We found that as the top end was deployed, the fish mouth sometimes retracted a short distance which was difficult to compensate for in our early experience, but as confidence increased, we were able to place the device accurately without fear of covering one of the renal artery ostia. The device provided a long-term fix for those with angulated necks, both in terms of freedom from long term type 1 endoleaks (1.6% v 3.1% for the low angle neck group), and also freedom from sac expansion at 5 years (80% v 74% for the low angle group). In a further analysis to confirm the long-term performance of the device in angulated necks, the reduction AAA sac size over 5 years was 22% versus only 10% in the low angle neck group. Whether this difference in sac reduction is due to the device or differences in aortic morphology between the 2 groups it is not possible to say from our study.

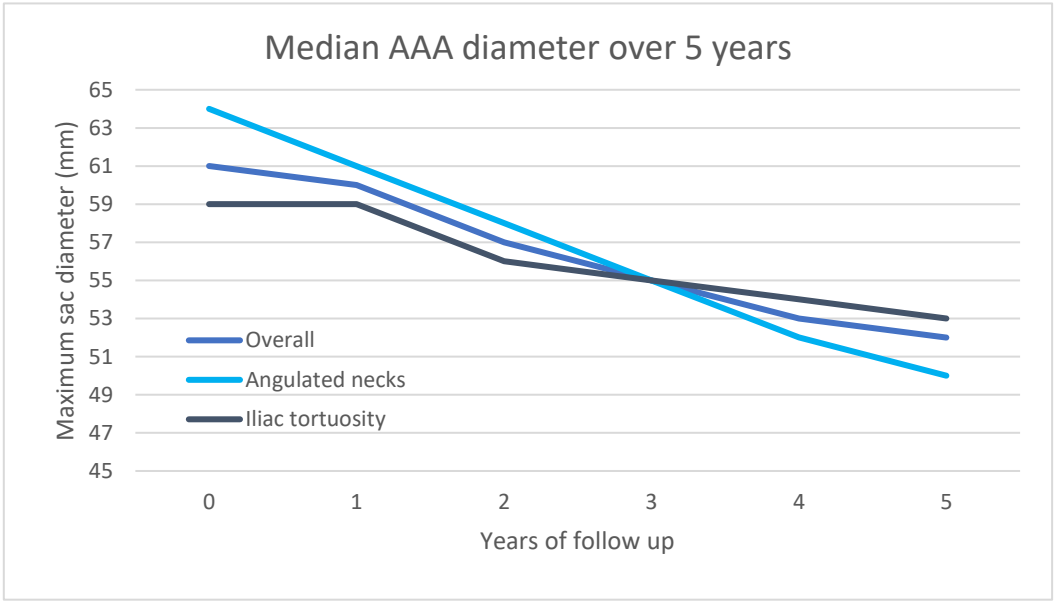
The neck angulation analysis was taken further and a comparison between the 28 cases with a neck angle from 60-75o against those 35 cases with a greater than 75o neck angle. Analysis of the survival curves for these two groups did not differ significantly. In addition, the AAA sac reduction over 3 years was 20% in the highly angulated group versus 10% for the angulated group. Similarly, the proportion of patients with sac expansion >5 mm by 3 years was 0/15 against 2/15. So even in this very challenging subset, there is evidence for the durability of the device in treating cases that would be off-label for any other device available at that time.

Years	0	1	2	3	4	5	6	7	8	9	10
Overall	127	113	91	65	54	45	36	25	16	9	3
Angulated necks	63	59	47	31	27	19	15	11	5	4	1
Iliac tortuosity	64	54	44	34	27	26	21	14	11	5	2

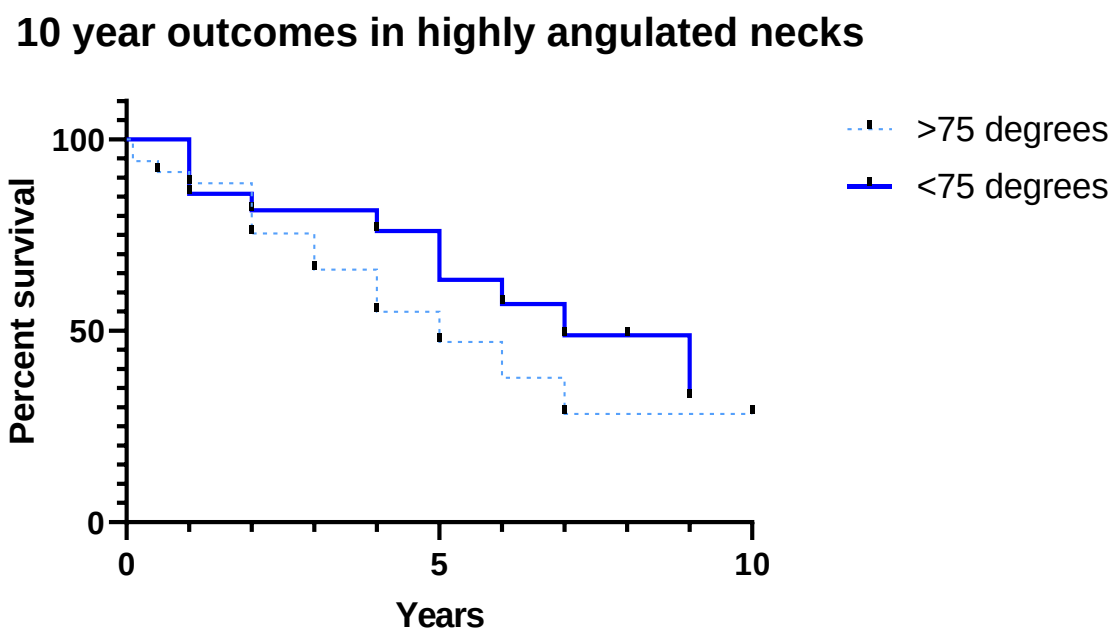
Survival proportions



Change in sac size



Highly angulated neck survival



Anatomical and durability comparison for patients with highly angulated (>75º) and angulated necks (<75º) across a 5-year period

	Highly angulated necks (>75º)	Angulated necks (<60º-75º)	P=
Median Neck length	29.5mm	36.5mm	0.58
Median Neck diameter	26mm	22mm	0.003
Median Neck angle	85º	66º	0.0001
Median AAA diameter	66mm	60.5mm	0.91
Change in AAA diameter from baseline	1yr 9.6% 3yrs 20% 5 yrs 15.6%	1yr 7.3% 3 yrs 10.0% 5 yrs 12.8%	0.41 0.16 0.95
Proportion of patients with >5mm sac expansion	1yr 0/29 3yrs 0/15 5yrs 2/7	1yr 2/28 3yrs 2/15 5yrs 2/12	0.46 0.46 0.84

Conclusion

Aorfix is a safe and effective endovascular stent graft which can be utilised in patients with hostile anatomical features, allowing a wider range of aneurysm morphologies to be treated.

5.3 An overall summary of the clinical performance and safety

Through the data collected in 3 clinical studies, Pythagoras, VQI, and Norfolk and Norwich, Lombard Medical determine that Aorfix is safe and effective for use within its intended purpose.

5.4 Ongoing or planned post-market clinical follow-up

Lombard Medical intends to use the Japanese national registry to collect further clinical data for Aorfix.

6. Possible diagnostic or therapeutic alternatives

Treatment of abdominal aortic aneurysms (AAAs) consists of surgical repair. When indicated, an un-ruptured aneurysm can undergo elective surgical repair; a ruptured AAA calls for emergency repair. Possible approaches include the traditional open laparotomy, newer minimally invasive methodologies, and the placement of endovascular stents. Surgical repair should be performed as expediently as possible by an experienced surgeon.

The decision to treat an un-ruptured AAA is based on operative risk, the risk of rupture, and the patient's estimated life expectancy. Operative risk is based on patients' comorbidities and hospital factors.

There are two primary methods of AAA repair, open and endovascular. Open AAA repair requires direct access to the aorta via an abdominal or retroperitoneal approach. Open repair is well established as definitive treatment, having been in use for over 50 years. Generally, endovascular repair is advocated for patients who are at increased risk with open repair, but until results from randomized controlled trials are available, patient preference is the strongest determinant in deciding between endovascular and open approaches.

Open Repair

The aorta may be approached either trans-abdominally or through the retroperitoneal space. Juxtarenal and suprarenal aortic aneurysms are approached from the left retroperitoneal space. Depending on the anatomy, the aorta can be reconstructed with a tube graft, an aortic iliac bifurcation graft, or an aorto-femoral bypass.

7. Suggested profile and training for users

Intended for use by medical professionals trained in the use of Aorfix™ AAA Endovascular Stent Graft.
Lombard Medical requires that medical practitioners using the system are adequately trained in surgical and in particular endovascular techniques.

8. Reference to applied standards and common specifications

Standard	Date	Title
Medical Device Regulation 2017/745	2017	Medical Device Regulation (MDR)
BS EN ISO 13485	2016/A11:2021	Quality Management Systems – Requirements for Regulatory Purposes.
BS EN ISO 14971	2019+A11:2021	Medical Devices: Application of Risk Management to Medical Devices.
BS EN ISO 7153-1	2016	Surgical Instruments. Metallic Materials. Stainless Steel.
BS EN ISO 11135	2014+A1:2019	Sterilization of health care products. Ethylene Oxide. Requirements for development, validation and routine control of a sterilization process for medical devices.

BS EN ISO 11138-2	2017	Sterilization of health care products. Biological indicators for ethylene oxide sterilization processes.
BS EN ISO 556-1	2001	Sterilization of medical devices. Requirements for medical devices to be designated “STERILE”. Requirements for terminally sterilized medical devices.
BS EN ISO 14644-1	2015	Cleanrooms and associated controlled environments. Classification of Air Cleanliness.
BS EN ISO 14644-4	2022	Cleanrooms and associated controlled environments – Part 4: Design, construction, and start-up
BS EN ISO 10993-1	2020	Biological evaluation of medical devices. Part 1- Evaluation and Testing within a risk management process
BS EN ISO 10993-3	2014	Biological evaluation of medical devices Part 3: Test for genotoxicity, carcinogenicity, and reproductive toxicity
BS EN ISO 10993-4	2017	Biological evaluation of medical devices Part 4: Selection of tests for interactions with blood
BS EN ISO 10993-5	2009	Biological evaluation of medical devices Part 5: Tests for in vitro cytotoxicity
BS EN ISO 10993-6	2016	Biological Evaluation of Medical Devices- Part 6: Tests for local effects after implantation
BS EN ISO 10993-7	2008+A1:2022	Biological Evaluation of Medical Devices- Part 7: Ethylene oxide sterilization residuals
BS EN ISO 10993-10	2023	Biological Evaluation of Medical Devices- Part 8: Tests for Irritation and Skin Sensitization
BS EN ISO 10993-11	2018	Biological Evaluation of Medical Devices – Part 11: Tests for Systemic Toxicity
BS EN ISO 10993-12	2021	Biological Evaluation of Medical Devices- Part 12: Sample Preparation and Reference Materials
BS EN ISO 10993-15	2023	Biological Evaluation of Medical Devices- Part 15: Identification and Quantification of Degradation Products from Metals and Alloys
BS EN ISO 10993-23	2021	Biological evaluation of medical devices – Tests for irritation
BS EN ISO 11607-1	2020+A1:2023	Packaging for terminally sterilized medical devices. Requirements for materials, sterile barrier systems and packaging systems
BS EN ISO 20417	2021	Information supplied by the manufacturer with medical devices.
BS EN ISO 15223-1	2021	Medical devices. Symbols to be used with medical device labels, labelling, and information to be supplied.
BS EN ISO 25539-1	2017	Cardiovascular Implants. Endovascular devices. Endovascular Prosthesis.
BS EN ISO 14630	2006	General requirements for non-active surgical implants.
BS ISO 7198	2017	Cardiovascular implants – Tubular vascular prostheses.
BS EN ISO 10555-1	2013+A1:2017	Sterile, single-use intra-vascular catheters – General requirements.
BS 7252-13/ISO 13782	1997/2019	Metallic materials for Surgical Implants: Spec. for unalloyed Tantalum for surgical implant applications.
ISTA procedure 2a	2011	Transit Testing of Packages

BS EN ISO 14155	2020	Clinical Investigation of Medical Devices for human subjects.
ASTM F2503	2020	Standard Practice for Marking Medical Devices and Other Items for Safety in the Magnetic Resonance Environment
IEC 62366-1	2015	Medical Devices – Part 1: Application of Usability Engineering
MEDDEV 2.7.1 Rev 4	2016	Clinical evaluation: A guide for Manufacturers and Notified Bodies under Directives 93/42/EEC and 90/385/EEC
MEDDEV 2.12-1	8	Guidelines on a medical devices vigilance system.
(EU) 2023/607	2023	Regulation (EU) 2023/607 of the European Parliament and of the Council of 15 March 2023 amending Regulations 2017/745 and (EU) 2017/746 as regards the transitional provisions certain medical devices and in vitro diagnostic medical devices
MDCG 2019-9	2022	Rev 1 - Summary of safety and clinical performance: A guide for manufacturers and notified bodies
MDCG 2020-6	2020	Guidance on sufficient clinical evidence for legacy devices
MDCG 2020-7	2020	Post-market clinical follow-up Plan Template. A guide for manufacturers and notified bodies
MDCG 2020-8	2020	Guidance on PMCF evaluation report template
MDCG 2020-15	2020	Position paper on the use of the EUDAMED actor registration module and of the Single Registration Number (SRN) in the Member States
MDCG 2021-12	2021	FAQ on the European Medical Device Nomenclature (EMDN)
MDCG 2022-12	2022	Guidance on harmonised administrative practices and alternative technical solutions until Eudamed is fully functional
MDCG 2019-8	2020	V2 Guidance document Implant card on the application of Article 18 Regulation (EU) 2017/745 on medical devices
MDCG 2021-11	2021	Guidance on Implant Card – Device types
MDCG 2022-16	2022	Guidance on Authorised Representatives
MDCG 2020-3	2023	Guidance on significant changes regarding the transitional provision under Article 120 of the MDR with regard to devices covered by certificates according to MDD or AIMDD
MDCG 2018-1	2021	Rev 4 - Guidance on basic UDI-DI and changes to UDI-DI
MDCG 2021-19	2021	Guidance note on integration of the UDI within an organisation’s quality management system

9. Revision history

SSCP revision number	Prepared by / Date issued	Change description	Revision validated by the Notified Body
1	Matthew Burden 07Dec2022	Document creation	☐ Yes ☒ No Validation language: English
2	Matthew Burden 16 Nov 2023	Applied standards updated. Removal of information intended for the patient. The patient is not the intended user.	☐ Yes ☒ No Validation language: English