1.0 Device Identification and General Information

i) Device trade names: Artegraft Collagen Vascular Graft

ii) Document Number: RCD 131-001-01 Rev. New

iii) Manufacturer's name and address:

Legal manufacturer name:	Artegraft, Inc.
Address:	206 North Center Drive, North Brunswick, NJ, 08902 USA

iv) SRN: US-MF-000016778

v) Basic UDI-DI: 0316837ArtegraftDW

vi) Device Item Codes, Descriptions, Basic UDI, GMDN Code and MDR Classification

Model Number	Description	GTIN
AG540M	4mm, 40cm	00316837000008
AG630M	5mm, 30cm	00316837000015
AG636M	5mm, 35cm	00316837000022
AG640M	5mm, 40cm	00316837000039
AG645M	5mm, 45cm	00316837000046
AG715M	6mm, 15cm	00316837000053
AG730M	6mm, 30cm	00316837000060
AG735M	6mm, 35cm	00316837000077
AG740M	6mm, 40cm	00316837000084
AG745M	6mm, 45cm	00316837000091
AG750M	6mm, 50cm	00316837000107
AG830M	7mm, 30cm	00316837000114
AG840M	7mm, 40cm	00316837000121
AG845M	7mm, 45cm	00316837000138
AG1015M	8mm, 15cm	00316837000145
AG1030M	8mm, 30cm	00316837000152
AG535	4mm x 35cm	00316837000190
AG540	4mm x 40cm	00316837000206
AG616	5mm x 16cm	00316837000213
AG630	5mm x 30cm	00316837000220
AG636	5mm x 35cm	00316837000237
AG640	5mm x 40cm	00316837000244
AG645	5mm x 45cm	00316837000251
AG715	6mm x 15cm	00316837000268
AG730	6mm x 30cm	00316837000275
AG735	6mm x 35cm	00316837000282
AG740	6mm x 40cm	00316837000299
AG745	6mm x 45cm	00316837000305
AG750	6mm x 50cm	00316837000312
AG830	7mm x 30cm	00316837000367
AG840	7mm x 40cm	00316837000329
AG845	7mm x 45cm	00316837000336
AG1015	8mm x 15cm	00316837000343
AG1030	8mm x 30cm	00316837000350

LeMaitre Vascular Inc. has decided to add the suffix "M" to the currently marketed US catalog numbers and create new UDIs to be proposed to be marketed in EU and UK under MDR.

a. Medical device nomenclature description / text
P07010199 VASCULAR PROSTHESES, BIOLOGICAL

b. Class of device

Manufacture Name	GMDN Code	MDR Classification	Rule
Artegraft Collagen Vascular Graft	13586	III	18

vii) Year when the first certificate (CE) was issued covering the device

Device Name	Date of Initial CE Mark	Date/No. of PMA
Artegraft Collagen Vascular Graft	NA	01 Aug 1979 / N16837

viii) Authorized representative if applicable; name and the SRN

EU Authorized Representative:	LeMaitre Vascular GmbH Otto-Volger-Str. 5 a/b 65843, Sulzbach/Ts Germany
SRN:	DE-AR-000013539

ix) NB's name (the NB that will validate the SSCP) and the NB's singleidentification number:

BSI Group The Netherlands B.V.
Identification Number: 2797
Say Building, John M. Keynesplein 9, 1066 EP
Amsterdam, Netherlands

2.0 Intended use of the device

i) Intended purpose: The Artegraft is intended to serve as a substitute conduit for blood where bypass or replacement of occluded or diseased arterial segments is required or to establish a conduit for hemodialysis.

ii) Indication(s) and target population(s)

- Indication: The Artegraft is indicated for the following:
  - Hemodialysis
    - Arteriovenous (AV) fistula salvage and repair
    - Primary AV Graft
    - AV Graft Replacement
  - Lower extremity bypass
  - Arterial trauma
- Target Population: Adults of any gender or ethnicity that need an arterial bypass or arteriovenous shunt or surgery requiring an arterial graft.

iii) Contraindications and/or limitations

- The Artegraft should not be used in venous or low pressure systems.

3.0 Device Description

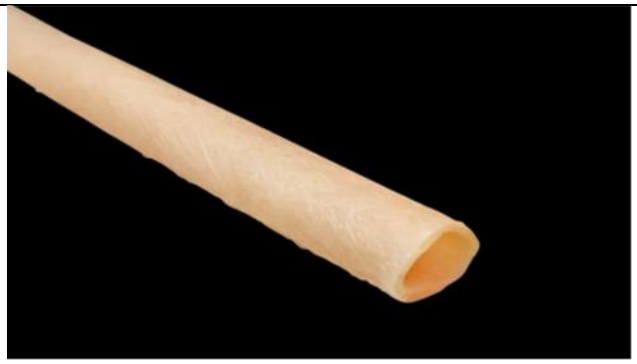
i) Description of the device

The Artegraft is composed of a section of specially selected bovine carotid artery that has been subjected to enzymatic digestion.

The Artegraft Collagen Vascular Graft is of bovine origin and the surgical staff must prepare the graft for implantation. The sterile graft is preserved in a tube filled with USP purified water and ethyl alcohol.he Artegraft is composed of a section of specially selected bovine carotid artery that has been subjected to enzymatic digestion with ficin and tanned with dialdehyde starch. The Artegraft is intended for use distal to the aorta as a segmental arterial replacement, as an arterial bypass, as an arteriovenous shunt where more conventional methods have proven inadequate, or as an arterial patch graft. The function and action of the Artegraft is simply to serve as a substitute conduit for blood where bypass or replacement of occluded or diseased arterial segments is required or to establish a conduit for hemodialysis.

The collagen graft is composed of specially selected and harvested bovine carotid arteries which have been subjected to enzymatic digestion with ficin enzyme solution and tanned with dialdehyde starch solution to cross link the collagen matrix in order to maximize strength and performance. Artegraft is of biological origin and the surgical staff must prepare the graft for implantation. Instructions for implant are defined in the IFU. The sterile graft is preserved in a tube filled with USP purified water and ethyl alcohol. The Artegraft is packaged in a specially designed tube containing a sterilizing solution prepared with 1% propylene oxide in 40% aqueous U.S.P. ethyl alcohol. Each tube is enclosed in a set-up box for protection during shipment and storage.

Image of the device

ArteGraft Collagen Vascular Graft	

The length and inner diameter of each Artegraft are specified on the packaging labels. The inner diameter of the Artegraft is approximate, rounded to the nearest mm, due to the nature of the biologic source material. The availability of graft diameters and lengths is dependent upon the animal source. Product codes and sizes are referenced in the chart below. Outer diameters vary, but typically 1mm larger.

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

In 1970, the original US FDA approval for the Artegraft® Collagen Vascular Graft™ was obtained by sponsor Johnson & Johnson. In 1993, Artegraft, Inc. purchased the rights and assets of

Artegraft® Collagen Vascular Graft™ including all regulatory approvals and assets from Johnson & Johnson. LeMaitre Vascular, Inc. purchased the rights and assets in 2021.

The Artegraft® Collagen Vascular Graft™ has been in continuous commercial distribution, both in the USA and in periodic international distribution since its initial US FDA NDA/PMA approval in 1970. The process of obtaining the harvested carotid arteries, subjecting these arteries to tissue stripping, various chemical processes, ligation, pressure testing, sizing and other activities through terminal sterilization, has remained virtually unchanged since the original NDA approval by the FDA in 1970 (NDA 16-837). The only changes to the packaged graft have been the change from a glass outer package to a PET plastic outer primary package and the addition of additional suppliers for the bovine arteries. These changes were approved by the US FDA via individual PMA Supplements, on file. In addition to FDA approvals, the suppliers of these new materials were subjected to the standard QS Artegraft, Inc. supplier certification process.

iii) Description of any accessories which are intended to be used in combination with the device:

- No accessories are supplied with this device.

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

- No other devices or products are intended to be used in combination with this device.

4.0 Risks and Warnings

i) Residual risks and undesirable effects

- Residual risk evaluation is conducted as part of our FMEAs and risk management procedure. We conclude that the benefits outweigh any residual risks and that the risk has been reduced as far as possible

ii) Warnings and precautions

Warnings

1. Do NOT re-sterilise the Artegraft. Use the graft immediately after opening the package and discard any unused portions.
2. The graft should not be used after the expiration date imprinted on the label.
3. After the Artegraft has been removed from the container in the manner prescribed to preserve its sterility, it should be gently and thoroughly washed and rinsed to minimize carryover of preserving fluid.
4. Silk is not recommended for anastomosis.
5. The graft is not to be used unless the capacity of the run-off vessel is adequate, as shown by pre-operative arteriography. Artegraft selection must be of comparable cross-sectional diameter to the host artery, particularly at the distal end, in order to avoid early thrombosis.
6. A minimum of ten days should be allowed after implantation before puncturing the graft with needles for hemodialysis. If edema appears around or distal to the graft, this should be allowed to resolve before cannulation.
7. Avoid external compression of the graft.

Precautions

1. In the event of early occlusion, re-exploration of the graft and removal of the thrombus with an embolectomy or thrombectomy catheters results in effective restoration of long-term patency.

2. Patients subjected to heparin anticoagulant rinse and flush should be confirmed to be heparin-induced thrombocytopenia (HIT) free, and of heparin associated allergic reactions. Some surgeons recommend systemic heparinization of the patient after completion of the preparatory dissection, with or without subsequent neutralization with protamine sulfate. Others rely on the periodic injection of diluted heparin into the arterial tree during the period of vascular clamping and anastomosis. Post-operative heparinization is usually not employed.

3. During implantation ensure the graft does not twist as it is tunneled to its distal location.

4. Clinical evidence suggests that subfascial, rather than subcutaneous, implantation in the lower extremity is the more satisfactory procedure.

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

- The table below lists 2 CAPAs relevant to the safety and performance of the subject device that were opened between 01 January 2017 to 01 December 2022.

CAPA summary

Reference Number	CAPA Description Summary	Corrective Action	Status (Date Closed)
Complaint 21-03-012	Inadequate instructions for use	IFU updated to include amount of saline to use during flush.	Closed (01 May 2021)
CAPA-00039	Packaging error	Demo graft used in error. Hospital notified to destroy all "DEMO" labeled grafts.	Closed (6 October 2017)

There were 0 FSCAs / recalls that have been initiated or reported for the subject device from 01 January 2017 to 01 December 2022.

Complaints by Region / Year	2017	2018	2019	2020	2021	2022*	Total
Total Sales	11,006	12,910	14,310	7,962	14,259	14,263	74,710
Total Complaints	24	12	11	9	14	11	81
Total Complaint Rate	0.218%	0.093%	0.077%	0.113%	0.098%	0.077%	0.108%
Europe	**2017**	**2018**	**2019**	**2020**	**2021**	**2022***	**Total**
Complaints	0	0	0	0	0	0	0
Sales	0	0	0	0	0	0	0
Rate (complaints/sales)	-	-	-	-	-	-	-
Americas	**2017**	**2018**	**2019**	**2020**	**2021**	**2022***	**Total**
Complaints	24	12	11	9	14	11	81
Sales	11,006	12,910	14,310	7,962	14,259	14,263	74,710

Rate (complaints/sales)	0.218%	0.093%	0.077%	0.113%	0.098%	0.077%	0.108%
Asia	**2017**	**2018**	**2019**	**2020**	**2021**	**2022***	**Total**
Complaints	0	0	0	0	0	0	0
Sales	0	0	0	0	0	0	0
Rate (complaints/sales)	-	-	-	-	-	-	-

** Up to December*

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

i) Summary of clinical data related to equivalent device, if applicable:

- An equivalent device was not be used for this clinical evaluation.

ii) Summary of clinical data from conducted investigations of the device before the CE-marking, if applicable

All published literature has been reviewed in the writing of the clinical evaluation report. The more recent publications are used in preference to older studies to ensure our knowledge base keeps up with the state-of-the-art.

iii) Summary of clinical data from other sources, if applicable

Performance Outcomes

Technical success was defined in 4 studies as the graft being successful or functional for at least the first dialysis session. Technical success with Artegraft ranged from 82% to 100%.9,[25,28,41] A single study compared Artegraft to ePTFE and found no significant difference in successful graft use for dialysis (p= 0.055).25

A total of 7 studies reported primary patency rates of Artegraft used for hemodialysis access with follow-ups ranging from 30 days to 40 months and the majority of studies using Kaplan-Meier estimates. At 30 days, 90 days, and 3 months, primary patency was reported as 84.3%[42], 78.3%[42], and 85.5% respectively.[9] At 4 months, Artegraft had a primary patency rate of 69% while ePTFE had a primary patency rate of 44.1%.[10] At 6 months or 180 days, primary patency for Artegraft ranged from 36% to 73.3%.[9,25,42] A single study comparing Artegraft (36%) to ePTFE (46%) found no differences in primary patency (p=0.27).[25] At 8 months, primary patency for Artegraft was 64.8% while ePTFE was 20.2%; however, statistical values were not reported.[10] At 1 year, primary patency for Artegraft ranged from 30% to 67%.[9,10,25,29,39,43] Two studies comparing Artegraft to ePTFE found that primary patency was significantly higher in Artegraft compared to ePTFE (p=0.0229; p=0.006210). At 16, 18, and 20 months, primary patency was 44.1%, 73.3%, and 38.5%, respectively.[9,10] At 2 years, Artegraft primary patency ranged from 16% to 33%[10,25,29] and a single study comparing Artegraft to ePTFE found primary patency was significantly higher in Artegraft (p=0.03).[29] At 28 to 40 months, Artegraft primary patency was 19.3% while ePTFE primary patency was 10.1%.[10] Lastly, although rates were not reported, primary patency was similar in elderly patients that had Artegraft compared to arteriovenous fistulas for hemodialysis access according to Kaplan-Meier curves across 60 months (p=0.83).[26]

At 30 days, 90 days, and 3 months, primary assisted patency was reported as 94.1%[42], 88.1%[42], and 100% respectively.[9] At 4 months, Artegraft had a primary assisted patency of

72% while ePTFE had a primary assisted patency of 44.4%.[10] At 6 months or 180 days, primary assisted patency for Artegraft ranged from 43% to 100%.[9,25,42] A single study comparing Artegraft (43%) to ePTFE (48%) found no differences in primary assisted patency (p=0.57).[25] At 8 months, primary assisted patency for Artegraft was 64.8% while ePTFE was 31.2%; however, statistical values were not reported.[10] At 1 year, primary assisted patency for Artegraft ranged from 36% to 100%.[9,10,25,29,43] Two studies comparing Artegraft to ePTFE found that primary assisted patency was significantly higher in Artegraft compared to ePTFE (p=0.0329; p=0.01210). At 16, 18, and 20 months, primary assisted patency was 40.5%, 67%, and 40.5%, respectively.[9,10] At 2 years, Artegraft primary assisted patency ranged from 24% to 57%[10,25,29] and a single study comparing Artegraft to ePTFE found primary assisted patency was significantly higher in Artegraft (p=0.02).[29] At 28 to 40 months, Artegraft primary patency was 40.8% while ePTFE primary assisted patency was 13.8%.10

At 30 days, 90 days, and 3 months, secondary patency was reported as 100%[42, 97].8%[42], and 100% respectively.[9] At 4 months, Artegraft had a secondary patency of 92.1% while ePTFE had a secondary patency of 88.6%.[10] At 6 months or 180 days, secondary patency for Artegraft ranged from 71% to 91.6%.[9,25,42] A single study comparing Artegraft (71%) to ePTFE (51%) found no differences in secondary patency (p=0.05).25 At 8 months, secondary patency for Artegraft was 64.7% while ePTFE was 88.6%; however, statistical values were not reported.[10] At 1 year, primary assisted patency for Artegraft ranged from 60.1% to 89%.[9,10,25,29,39,43] Two studies comparing Artegraft to ePTFE found that secondary patency was similar in Artegraft compared to ePTFE (p=0.5329; p=n.s.10). At 16, 18, and 20 months, secondary patency was 73.2%, 89%, and 73.2%, respectively.[9,10] At 2 years, Artegraft secondary patency ranged from 56% to 67%[10,25,29] and a single study comparing Artegraft to ePTFE found secondary patency was similar (p=0.69).[29] At 28 to 40 months, Artegraft secondary patency was 64.1% while ePTFE secondary patency was 59.2%.[10] Secondary patency was similar in elderly patients that had Artegraft compared to arteriovenous fistulas for hemodialysis access according to Kaplan-Meier curves across 60 months (p=0.07).[26]

Safety Outcomes

Potential risks included in the IFU that were not reported in the clinical literature included pseudointima formation, pseudodiaphragm formation, disruption of anastomoses in the presence of infection and transient low grade fever, and high output congestive heart failure in patients with heart disease. Thrombosis was reported in 4 studies with rates ranging from 6% to 53% [27,39,41,42] and an additional 2 studies reported thrombosis complication per year as 0.17 to 0.34 and found that Artegraft resulted in significantly less thrombosis per patient year compared to ePTFE (p=0.0229; p=0.0110). A single study reported deep vein thrombosis occurred in 0 of 4 patients.[28] Three (3) studies reporting infection rates following Artegraft ranged from 0% to 3.9%[39,41,42] and a single study reporting infection rates per patient year was comparable between Artegraft and ePTFE (p=0.76).[10] Graft infection was reported in 4 studies and rates ranged from 6% to 15% with no differences comparing Artegraft to ePTFE. [9,25,29,43] Aneurysm was reported in 3 studies and rates ranged from 0% to 25%; however, the study reporting a 25% rate was in a low sample size (aneurysm occurred in 1 of 4 patients). [9,28,41] This same study also reported bleeding in 2 of 4 patients[28] while other studies reported bleeding occurred in 1% to 3% of patients. [39,41]

Hematoma was reported in 3 studies and rates ranged from 0% to 7.8%.[28,39,42] Lastly, steal or steal syndrome rates ranged from 4% to 25% and rate per patient year ranged from 0.03 to 0.09 with those that compared Artegraft to ePTFE finding comparable results.

An overall summary of the clinical performance and safety

The clinical literature review identified 4 new articles relating to the safety and/or performance of the subject device when used as intended. A total of 216 patients representative of the intended population were treated with the subject device in these newly-identified studies. The clinical data on these patients was gathered from 3 uncontrolled studies[1,2,12] and 1 case series.[9] Controlled studies included comparisons to Intergard Synergy (Getinge AB),[2] Vascu-Guard (Baxter International, Inc.),[2] a composite of Vascu-Guard and Omniflow II,[2] bovine artery (Shelhigh, Inc.),[1] ProCol Vascular Bioprosthesis (LeMaitre Vascular),[1] autologous vein graft,[1] cryopreserved arterial homograft, and xeno-pericardial patch.[1]

Findings from the clinical literature support the performance of the subject device, which include patency, survival/mortality rate, limb salvage/ amputation rate, and reintervention rate. Safety outcomes with the subject device included device-related adverse events (graft aneurysm/stenosis, graft occlusion, and infection/reinfection). The outcomes relating to the safety and performance of the subject or equivalent device are consistent with those expected for this type of device when used as intended.

Based on this clinical evaluation, which includes both non-clinical and clinical data, there is sufficient data to demonstrate conformity to the applicable requirements and confirm that the subject device is safe and performs as intended and claimed and is state of the art device for use for vascular access or in vascular bypass or repair. Review of the post-market data, information materials and the risk management documentation confirms that the risks are appropriately identified and consistent with the state of the art, and that the risks associated with the use of the device are acceptable when weighed against the benefits.

iv) **Ongoing or planned post-market clinical follow-up**

Ongoing post-market surveillance (PMS) of the subject device according to the following procedure, SOP 090. Post-Market Clinical Follow-up (PMCF) activities are planned for the subject device. A multi-stepped approach will be used to substantiate the performance claims of the device and ensure that the risk/benefit remains positive. First, a thorough literature review will be conducted to capture all relevant and up to date published information regarding the Omniflow device.

At this current time, no PMCF studies have been initiated.

6.0 Possible diagnostic or therapeutic alternatives:

- Vascular prosthesis with alternative materials
- Catheter for short-term vascular access
- Endovascular therapy
- Arteriovenous fistula for long-term vascular access

These have the same or similar intended purpose as the Artegraft but, as described in the table below, have different technological characteristics than the Artegraft.

Table: Overview of treatment options

Treatment Options / Device Group	Description	Advantages	Disadvantages
Vascular prosthesis with alternative materials	Synthetic grafts composed of Dacron, PTFE, or autologous vein graft	Biological graft: Theoretically, biological grafts would mimic the compliance of native tissue and be more resistant to intimal hyperplasia and wall degeneration than synthetic grafts.[31] Dacron graft: Well-established vascular graft material.[31,32] ePTFE: ePTFE/PTFE grafts have been widely used for hemodialysis since the 1970s.[31] Do not require pre-clotting, unlike Dacron grafts.[31] Good long-term durability.[2]	Biological graft: Long-term durability is a concern. May be prone to aneurysm and rupture.[2] Relatively high cost.[2] Dacron graft: Rates of infection and integration are reportedly worse than ePTFE grafts in vascular access applications.[31,32] ePTFE: Neointimal hyperplasia and distal arteriosclerosis are risks.[31]
Catheter for short-term vascular access	Tunneled cuffed central venous catheters for arteriovenous access	Recommended for long-term AV access when creation of fistulas or grafts is impossible or in patients with limited life expectancy[2]	Higher risk of infection and hospitalization and lower survival compared to permanent access types such as arteriovenous fistula and arteriovenous grafts.[25]
Endovascular therapy	Includes balloon angioplasty, stents and stent-grafts, plaque debulking, thrombolysis, remote superficial femoral artery endarterectomy (RSFAE) and percutaneous thrombectomy	Less invasive than open surgical procedures; recommended as first choice of therapy for focal occlusive disease of the superficial femoral artery and femoropopliteal lesions <25 cm.[32] Also recommended as first choice of therapy for mesenteric artery occlusion.[33]	May not be effective for diffuse arterial disease or in cases of extensive calcification.[34,35]
Arteriovenous fistula for long-term vascular access	Considered first-line for permanent vascular access for hemodialysis[36]	Potential for fewer infectious complications and higher patency rates.[36]	Patient with inadequate arterial and/or venous anatomy are not surgical candidates which is frequent in end-stage renal disease.[36]

7.0 Suggested profile and training for users:

The Artegraft is a surgical tool intended for use by experienced vascular surgeons trained in the procedures for which they are intended.

8.0 Reference to any harmonized standards and CS applied

Standard Title	Standard Reference: Revision Year
Sterilization of medical devices. Requirements for medical devices to be designated "STERILE". Part 2: Requirements for aseptically processed medical devices	EN 556-2:2015
Information supplied by the manufacturer of medical devices	EN 1041:2008
Cardiovascular implants and extracorporeal systems – Vascular prostheses -- Tubular vascular grafts and vascular patches	ISO 7198:2016
Biological evaluation of medical devices – Part 1: Evaluation and testing	ISO 10993-1:2009
Biological evaluation of medical devices – Part 3: Tests for genotoxicity, carcinogenicity and reproductive toxicity	ISO 10993-3:2009
Biological evaluation of medical devices – Part 4: Selection of tests for interactions with blood	EN ISO 10993-4:2006
Biological evaluation of medical devices – Part 5: Tests for in vitro cytotoxicity	ISO 10993-5:2009
Biological evaluation of medical devices – Part 6: Tests for local effects after implantation	EN ISO 10993-6:2007

Biological evaluation of medical devices – Part 10: Tests for irritation and delayed-type hypersensitivity	ISO 10993-10:2010
Biological evaluation of medical devices – Part 11: Tests for systemic toxicity	ISO 10993-11:2018
Biological evaluation of medical devices Part 17: Establishment of allowable limits for leachable substances	EN ISO 10993-17:2008
Packaging for terminally sterilized medical devices – Part 1: Requirements for materials, sterile barrier systems and packaging systems	ISO 11607-1:2006
Packaging for terminally sterilized medical devices – Part 2: Validation requirements for forming, sealing and assembly processes	ISO 11607-2:2006
Sterilization of medical devices – Microbiological methods – Part 1: Determination of a population of microorganisms on products	ISO 11737-1:2006
Tests of sterility performed in the definition, validation and maintenance of a sterilization process	ISO 11737-2:2009
Aseptic processing of health care products – Part 1: General requirements	ISO 13408-1:2008
Medical devices – Quality management systems – Requirements for regulatory purposes	EN ISO 13485:2016
Sterilization of health care products – Liquid chemical sterilizing agents for single-use medical devices utilizing animal tissues and their derivatives – Requirements for characterization, development, validation and routine control of a sterilization process for medical devices	ISO 14160:2011
Cleanrooms and associated controlled environments – Part 1: Classification of air cleanliness	ISO 14644-1:2015
Medical devices – Application of risk management to medical devices	EN ISO 14971:2012
Medical devices — Symbols to be used with medical device labels, labelling and information to be supplied —Part 1: General requirements	EN ISO 15223-1:2016
Medical devices utilizing animal tissues and their derivatives – Part 1: Application of risk management	ISO 22442-1:2015
Medical devices utilizing animal tissues and their derivatives – Part 2: Controls on sourcing, collection and handling	ISO 22442-2:2015
Medical devices utilizing animal tissues and their derivatives – Part 3: Validation of the elimination and/or inactivation of viruses and TSE agents	ISO 22442-3:2007

References:

1. Abbasi M, Chertow G, Hall Y. End-stage Renal Disease. American family physician. 2010;82(12):1512.
2. Schmidli J, Widmer MK, Basile C, et al. Editor's Choice - Vascular Access: 2018 Clinical Practice Guidelines of the European Society for Vascular Surgery (ESVS). Eur J Vasc Endovasc Surg. 2018;55(6):757-818.
3. Almasri J, Adusumalli J, Asi N, et al. A systematic review and meta-analysis of revascularization outcomes of infrainguinal chronic limb-threatening ischemia. Eur J Vasc Endovasc Surg. 2019;58(1s):S110-s119.
4. Ho KJ, Nguyen LL, Menard MT. Intermediate-term outcome of carotid endarterectomy with bovine pericardial patch closure compared with Dacron patch and primary closure. J Vasc Surg. 2012;55(3):708-714.
5. Matsagas MI, Bali C, Arnaoutoglou E, et al. Carotid endarterectomy with bovine pericardium patch angioplasty: mid-term results. Ann Vasc Surg. 2006;20(5):614-619.
6. Neuhauser B, Oldenburg WA. Polyester vs. bovine pericardial patching during carotid endarterectomy: early neurologic events and incidence of restenosis. Cardiovascular surgery (London, England). 2003;11(6):465-470.
7. Papakostas JC, Avgos S, Arnaoutoglou E, et al. Use of the vascu-guard bovine pericardium patch for arteriotomy closure in carotid endarterectomy. Early and long-term results. Ann Vasc Surg. 2014;28(5):1213-1218.
8. Lindsey P, Echeverria A, Cheung M, Kfoury E, Bechara CF, Lin PH. Lower Extremity Bypass Using Bovine Carotid Artery Graft (Artegraft): An Analysis of 124 Cases with Long-Term Results. World J Surg. 2018;42(1):295-301.
9. Harlander-Locke M, Jimenez JC, Lawrence PF, et al. Bovine carotid artery (Artegraft) as a hemodialysis access conduit in patients who are poor candidates for native arteriovenous fistulae. Vasc Endovascular Surg. 2014;48(7-8):497-502.
10. Kennealey PT, Elias N, Hertl M, et al. A prospective, randomized comparison of bovine carotid artery and expanded polytetrafluoroethylene for permanent hemodialysis vascular access. Journal of Vascular Surgery. 2011;53(6):1640-1648.
11. Rosenberg N. The bovine arterial graft and its several applications. Surgery, gynecology & obstetrics. 1976;142(1):104-108.
12. Chakfé N, Diener H, Lejay A, et al. Editor's Choice - European Society for Vascular Surgery (ESVS) 2020 Clinical Practice Guidelines on the Management of Vascular Graft and Endograft Infections. Eur J Vasc Endovasc Surg. 2020;59(3):339-384.
13. Gallieni M, Hollenbeck M, Inston N, et al. Clinical practice guideline on peri- and postoperative care of arteriovenous fistulas and grafts for haemodialysis in adults. *Nephrology Dialysis Transplantation.* 2019;34:II1-II42.
14. Betz T, Ingolf T, Markus S, Florian Z, Christian U. Evaluation of Long-Term Outcomes of Femoropopliteal Bypass Surgery in Patients With Chronic Limb-Threatening Ischemia in an Endovascular Era. *Ann Vasc Surg.* 2022;79:191-200.
15. Borghese O, Pisani A, Sapienza P. Treatment of lower limb arterial disease by Dardik graft: It takes one to know one. *J Med Vasc.* 2020;45(4):214-220.
16. Caradu C, Brunet C, Spampinato B, et al. Contemporary Results with the Biosynthetic Glutaraldehyde Denatured Ovine Collagen Graft (Omniflow II) in Lower Extremity Arterial Revascularization in a Septic Context. *Annals of Vascular Surgery*. 2022;85:22-31.
17. Evans W, Buchanan J, Goel R, Hardy S. Early Graft, Limb and Mortality Outcomes from the Omniflow II Bio-Synthetic Graft. *Ann Vasc Surg.* 2022;78:321-327.

18. Garbaisz D, Osztrogonácz P, Boros AM, Hidi L, Sótonyi P, Szeberin Z. Comparison of arterial and venous allograft bypass in chronic limb-threatening ischemia. *PLoS One.* 2022;17(10):e0275628.
19. Neufang A, Espinola-Klein C, Savvidis S, et al. External polytetrafluoroethylene reinforcement of varicose autologous vein grafts in peripheral bypass surgery produces durable bypass function. *Journal of Vascular Surgery.* 2018;67(6):1778-1787.
20. Neufang A, Duenschede F, Espinola-Klein C, et al. Contemporary results with the biosynthetic glutaraldehyde denatured ovine collagen graft (Omniflow II) in femoropopliteal position. *J Vasc Surg.* 2020;71(5):1630-1643.
21. Nguyen KP, Moneta G, Landry G. Venous Conduits Have Superior Patency Compared with Prosthetic Grafts for Femorofemoral Bypass. *Annals of Vascular Surgery.* 2018;52:126-137.
22. Socrate AM, Spampinato B, Zuccon G, Ferraris M, Costantini A, Piffaretti G. Outcomes of biosynthetic vascular graft for infrainguinal femoro-popliteal and femoro-distal revascularization. *J Cardiovasc Surg (Torino).* 2021;62(4):369-376.
23. van de Laar BC, van Heusden HC, Pasker-de Jong PC, van Weel V. Omniflow II biosynthetic grafts versus expanded polytetrafluoroethylene grafts for infrainguinal bypass surgery. A single- center retrospective analysis. *Vascular.* 2022;30(4):749-758.
24. Wee I, Choong AMTL. A systematic review of isolated radial artery harvesting as a conduit for lower limb bypass grafting. *Vascular.* 2019;27(2):224-230.
25. Arhuidese I, Reifsnyder T, Islam T, et al. Bovine carotid artery biologic graft outperforms expanded polytetrafluoroethylene for hemodialysis access. *J Vasc Surg.* 2017;65(3):775-782.
26. Cui J, Steele D, Wenger J, et al. Hemodialysis arteriovenous fistula as first option not necessary in elderly patients. *J Vasc Surg.* 2016;63(5):1326-1332.
27. Hurt AV, Batello Cruz M, Skipper BJ. Bovine carotid artery heterografts versus polytetrafluoroethylene grafts. A prospective, randomized study. *American Journal of Surgery.* 1983;146(6):844-847.
28. Kester RC. Arteriovenous grafts for vascular access in haemodialysis. *Br J Surg.* 1979;66(1):23- 28.
29. Marcus P, Echeverria A, Cheung M, Kfoury E, Shim K, Lin PH. Early Cannulation of Bovine Carotid Artery Graft Reduces Tunneled Dialysis Catheter-Related Complications: A Comparison of Bovine Carotid Artery Graft Versus Expanded Polytetrafluoroethylene Grafts in Hemodialysis Access. *Vasc Endovascular Surg.* 2019;53(2):104-111.
30. Reilly B, Khan S, Dosluoglu H, et al. Comparison of Autologous Vein and Bovine Carotid Artery Graft as a Bypass Conduit in Arterial Trauma. *Ann Vasc Surg.* 2019;61:246-253.
31. Ravari H, Kazemzade GH, Modaghegh MH, Khashayar P. Patency rate and complications of polytetrafluoroethylene grafts compared with polyurethane grafts for hemodialysis access. Upsala journal of medical sciences. 2010;115(4):245-248.
32. Ibeas J, Roca-Tey R, Vallespín J, et al. Spanish Clinical Guidelines on Vascular Access for Haemodialysis. Nefrologia. 2017;37:1-191.
33. Huber TS, Björck M, Chandra A, et al. Chronic mesenteric ischemia: Clinical practice guidelines from the Society for Vascular Surgery. Journal of Vascular Surgery. 2021;73(1):87S-115S.
34. Aboyans V, Ricco J-B, Bartelink M-LEL, et al. 2017 ESC Guidelines on the Diagnosis and Treatment of Peripheral Arterial Diseases, in collaboration with the European Society for Vascular Surgery (ESVS) – Web Addenda. European Heart Journal. 2017;00:1-22.
35. Conte MS, Pomposelli FB, Clair DG, et al. Society for Vascular Surgery practice guidelines for atherosclerotic occlusive disease of the lower extremities: Management of asymptomatic disease and claudication. Journal of Vascular Surgery. 2015;61(3):2S-41S.e41.
36. Kostakis ID, Loukopoulos I. Comparison between bovine carotid artery graft and polytetrafluoroethylene graft for haemodialysis vascular access: A systematic review and meta- analysis. J Vasc Access. 2021;22(1):26-33.
37. Kramer A, Boenink R, Stel VS, et al. The ERA-EDTA Registry Annual Report 2018: a summary. Clinical kidney journal. 2021;14(1):107-123.
38. Wani ML, Ahangar AG, Ganie FA, Wani SN, Wani NU. Vascular injuries: trends in management. Trauma Mon. 2012;17(2):266-269.
39. Abdoli S, Mahajan A, Han SM, Rowe VL, Katz SG, Ochoa CJ. Early cannulation of bovine carotid artery grafts (Artegraft) after primary vascular access and fistula revision procedures. J Vasc Surg. 2018;68(6):1865-1871.
40. DelGuercio ET, Kim KE, Onesti G, Swartz C. Measurement of intra-arterial blood pressure and cardiac output through the bovine artegraft. Hemodynamic measurements through the bovine artegraft. Nephron. 1975;14(3-4):257-262.
41. Katzman HE, Schild AF, Vanderwerf BA. Bovine artegraft arteriovenous fistulas for hemodialysis in one-hundred patients after "conventional" arteriovenous fistulas failed. Vasc Surg. 1976;10(3):169-175.
42. Naazie IN, Janssen C, Perez S, et al. Revision of Aneurysmal Arteriovenous Access with Immediate Use Graft Is Safe and Avoids Prolonged Use of Tunneled Hemodialysis Catheters. Ann Vasc Surg. 2022;87:295-301.
43. Pineda DM, Dougherty MJ, Wismer MC, et al. Bovine carotid artery xenografts for hemodialysis access. J Vasc Surg. 2017;65(6):1729-1734.
44. Babakhani A, Jindal RM. Tube banding to correct steal syndrome after arteriovenous fistula construction for hemodialysis. American Surgeon. 2014;80(3):E71-E73.

9.0 Revision Table:

SSCP revision number	Date issued	Change description	Revision validated by the NotifiedBody

001	See last page	Initial release	☐ Yes Validation language: English ☐ No (only applicable for class IIa or some IIb implantable devices (MDR, Article 52 (4) 2nd paragraph) for which the SSCP is not yet validated by the NB)

10. Patient information:

A summary of the safety and clinical performance of the device, intended for patients, is given below.

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 information presented below is intended for patients or lay persons. Your healthcare provider has a more extensive summary of safety and clinical performance.

The SSCP is not intended to give general advice on the treatment of a medical condition. Please contact your healthcare professional in case you have questions about your medical condition or about the use of the device in your situation. This SSCP is not intended to replace an implant card or the instructions for use to provide information on the safe use of the device.

1. **Device general information**
    - **a. Device trade name**
        - i. Artegraft Collagen Vascular Graft (Graft)
    - **b. Producer; name and address**
        - i. Artegraft, Inc., North Brunswick, NJ, 08902 USA
    - **c. Basic UDI-DI**
        - i. 0316837ArtegraftDW
    - **d. Year when the device was first CE-marked**
        - i. NA
2. **Intended use of the device**
    - **a. Intended purpose**
        - i. The Grafts are intended to be used as a replacement of diseased vessels.
        - ii. The Grafts are used in blood vessel and reconstructions requiring enhanced resistance to kinking and compression exerted by tendon and muscles. The Graft is usually used to repair and replace vessels in the legs and lower abdomen
    - **b. Indications and intended patient groups**
        - i. The Graft comes in knitted and woven grafts are indicated for use in the replacement or repair of abdominal and thoracic arteries affected with aneurismal or narrowing or blockages of an artery. The product is designed for patients with variable ages, weights, diagnoses and health statuses.
    - **c. Do not use for:**
        - i. The Grafts should not be used in coronary arteries and in patients with known or suspected negative reaction to any form of protein derived from cows.
3. **Device description**
    - **a. Device description and material/substances in contact with patient tissues**
        - i. The Grafts are made of synthetic material designed to replace sections of damaged or arteries. They are made of polyester PET thread woven into a seamless tube. The following materials are what make up the graft, polyester cow collagen and a preserving agent. All materials have passed testing to ensure they are safe to use
    - **b. Information about medicinal substances in the device, if any**
        - i. n/a
    - **c. Description of how the device is achieving its intended mode of action**
        - i. Per regulations, the Graft achieves its affect through non-medicinal means. It achieves this goal as a physical barrier device as its mode of action.
    - **d. Description of accessories, if any**

i. n/a

4. Risks and warnings

Contact your healthcare professional if you believe that you are experiencing side effects related to the device or its use or if you are concerned about risks. This document is not intended to replace a consultation with your healthcare professional if needed.

Patient Related Adverse Event	Severity	Occurrence	RPN
Stroke	8	2	16
Complete/partial paralysis in legs or lower abdomen	8	2	16
Partial paralysis of both legs	8	2	16
Heart attack	8	2	16
Kidney stops working	8	2	16
Blood flow limited	8	2	16
Blood clot that blocks blood flow	8	2	16
Blood clotting in vein	8	1	8
The process of losing blood from the body	8	2	16
Growth of germs in or around the wound	8	2	16
Bulge in the wall of an artery	8	2	16
Lung inflammation with tiny fluid filled air sacs	8	1	8
Loss or removal of a body part	8	1	8
Death	10	1	10
Injured blood vessel wall that leads to leaking	8	2	16
The formation of a blood clot inside the artery and vein	8	1	8
A serious condition that makes it difficult to breathe on your own	8	1	8
An irregular and often very rapid heart rhythm that can lead to blood clots in the heart	8	1	8
Fluid leaking into space between lung and chest wall	8	2	16
Temporarily not in ones right mind	8	1	8
Total or partial paralysis of one side of the body	8	1	8
Poor blood supply to nervous system	8	1	8
Numbness running down buttocks to back of legs	8	1	8
Intestines not able to move food through digestive system	8	1	8
Severe and sudden kidney failure	8	1	8
Swelling or bleeding occurs within a compartment usually in legs, feet, arms or hands	8	1	8
Leaking caused by space left between heart and valves	8	1	8
Tear in inner layer of your aorta, the main artery that delivers blood you're your heart to your body	8	1	8
Blood clot develops in veins deep in your body	8	1	8
Excessive movement due to disruption of the wires connecting the surgically divided sternum	6	1	6
Patient will need a two-part surgery combining open microsurgery and endovascular coiling. The reason for this surgery is to coil the entire diseased part of the blood vessel and then bypass the blood flow to the specific location in the brain	8	2	16
A bad bruise	6	1	6
A collection of fluid that builds up under the surface of your skin	6	1	6

An infection in any part of your urinary system	8	1	8
Local pain in the stomach area	8	1	8

Device Related Adverse Event	Severity	Occurrence	RPN
Graft is stretched or enlarged beyond normal	8	2	16
Graft losing cohesion or strength	8	2	16
Graft is narrowing	8	1	8
Graft is infected	8	1	8
Air in or around the graft	8	1	8

- **How potential risks have been controlled or managed**
  - Analysis have concluded that the benefits outweigh any residual risks and that the risk has been reduced as far as possible
- **Remaining risks and undesirable effects**
  - Please refer to the device IFU or your healthcare provider.
- **Warnings and precautions**

1. Your new device is a foreign body and therefore needs close monitoring and careful observation. It may take 6-8 weeks for full recovery.
2. After placement, the implant area maybe swollen and tender for up to a week.
3. Observe for any new redness or tenderness
4. Observe for any opening in the incisions.
5. Observe for numbness, tingling or pain in the leg.

NOTE if you experience any of the above (2-5) please contact your provider.

6. Do not puncture or manipulate the graft.
7. You may shower according to your provider's instructions.
8. Swelling in the extremity is expected because of increased blood flow. Move according to your provider's instructions, if the graft was implanted in your leg. Keep your leg elevated above your heart.
9. It is preferable to have the graft covered for the first week to protect skin and incisions. (Follow your provider's instructions).
10. Keep bandages or compression bandages on as per your provider's instructions.
11. If your staples have been removed, you will probably have Steri-Strips (small pieces of tape) across your incision. Wear loose clothing that does not rub against your incision.
12. You may shower or get the incision wet, once your provider says you can. DO NOT soak, scrub, or have the shower beat directly on them. If you have Steri-Strips, they will curl up and fall off on their own after a week.
13. DO NOT soak in the bathtub, a hot tub, or swimming pool. Ask your provider when you can start doing these activities again.
14. Your provider will tell you how often to change your dressing (bandage) and when you may stop using one. Keep your wound dry. If your incision goes to your groin, keep a dry gauze pad over it to keep it dry.
15. Clean your incision with soap and water every day once your provider says you can. Look carefully for any changes. Gently pat it dry.
16. DO NOT put any lotion, cream, or herbal remedy on your wound without asking your provider first if that is ok.
17. Bypass surgery does not cure the cause of the blockage in your arteries. Your arteries may become narrow again.
18. Eat a heart-healthy diet, exercise, stop smoking (if you smoke), and reduce stress. Doing these things will help lower your chances of developing a blocked artery again.
19. Your provider may give you medicine to help lower your cholesterol.
20. If you are taking prescriptions for high blood pressure or diabetes, take them as prescribed.

21. Your provider may ask you to take aspirin or a medicine called clopidogrel (Plavix) when you go home. These medicines keep your blood from forming clots in your arteries. DO NOT stop taking them without talking to your provider first.

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

a. Clinical background of the device

The Graft is categorized as Class II device in US and Class III device in EU. The Grafts are made of synthetic material and designed to replace sections of damaged or malfunctioning arteries. They are made of polyester thread woven into a seamless tube. In response to a range of surgical indications, the Grafts are offered in two designs: double velour knitted fabric and double velour woven fabric. The knitted grafts are designed with a run-proof structure to reduce the risk of fraying or wearing down at their ends. The velour grafts have low profile loops on their endoluminal surface to avoid any lumen reduction, and high profile loops on their outer surface to promote graft anchoring into the surrounding tissues. The AlboGraft will also be available with or without collagen coating. All of the grafts are crimped in parallel rings so that their tubular shape is maintained without kinking.

The Grafts are available with removable external spiral reinforcement made of a thread, allowing for easy identification with x-ray. The external spiral reinforcement is removable, helping the joining of the vessel to the graft.

The Grafts are made with collagen to reduce leakage so that no pre-clotting is necessary. The process of using bovine collagen maintains both the original structure of the material, and the structural characteristics of the graft, i.e. flexibility and softness.

b. The clinical evidence for the CE-marking

The device was first approved for CE mark under LeMaitre Vascular Inc. in 2011. Studies were conducted to ensure the grafts were safe and effective. See the IFU for further details.

c. Safety

There are ongoing clinical trials on this graft that will be used to confirm the safety and performance throughout the expected lifetime of the device through the proactive and continuous collection of data.

6. Possible alternatives

When considering alternative treatments, it is recommended to contact your healthcare professional who can take into account your individual situation.

7. Suggested training for users

a. This device is intended to be used by surgeons. Considering how complex this surgery is, it is left to the surgeon to proper surgery and graft type as well as the therapy to adopt before, during and after the operation.