Summary of Safety and Effectiveness Data

I. General Information

Device Generic Name:

Endovascular graft

Device Trade Name:

Endurant® Stent Graft System

Applicant's Name and Address:

Medtronic Vascular
3576 Unocal Place
Santa Rosa, CA 95403
USA

Premarket Approval Application (PMA) Number:

P100021

Date of Panel Recommendation:

None

Date of Notice of Approval to the Applicant:

December 16, 2010

II. Indications for Use

The Endurant Stent Graft System is indicated for the endovascular treatment of infrarenal abdominal aortic or aorto-iliac aneurysms in subjects with the following characteristics:

- Adequate iliac/femoral access that is compatible with vascular access techniques, devices and/or accessories
- Proximal neck length of $\geq$ 10 mm
- Infrarenal neck angulation of $\leq$ 60°
- Distal fixation length of $\geq$ 15 mm
- Aortic neck diameters with a range of 19-32 mm
- Iliac diameters with a range of 8-25 mm
- Morphology suitable for aneurysm repair

III. Contraindications

The Endurant Stent Graft System is contraindicated in:

- Patients who have a condition that threatens to infect the graft
- Patients who are sensitive to or have allergies to the device materials.

IV. Warnings and Precautions

Please see the warnings and precautions in the labeling (Instructions for Use).

V. Device Description

A. General Endurant Stent Graft System Description

The Endurant Stent Graft System is comprised of two key components: an implantable stent graft (Endurant Stent Graft) and a disposable delivery system (Endurant Delivery System). The pre-loaded stent graft is advanced to the aneurysm location over a guidewire. Upon retraction of the graft cover, the stent graft self expands to the indicated vessel diameter. During deployment and expansion, the stent graft is intended to form proximal and distal seal zones above and below the aneurysm location.

The Endurant Stent Graft System is modular and consists of four stent graft component configurations:

- Bifurcated (aorto-iliac) Component
- Contralateral Limb Component
- Iliac Extension Component
- Aortic Extension Component

Each component is introduced separately into the patient's vascular system. After the placement of the bifurcated and contralateral limb components, aortic and limb extension components may be introduced separately into the vessel and are mated *in vivo* to the components already *in situ*. All components are composed of nitinol metal stents sewn to a fabric graft. The suprarenal stents with anchor pins on the proximal end are laser cut from a nitinol tube. The wire formed stents are sewn to the polyester graft fabric using a polyester suture, whereas the suprarenal stents are sewn to the graft fabric using an ultra high molecular weight polyethylene suture. This suture is designed to aid in better stent to graft attachment strength, thus providing a more durable proximal attachment. Radiopaque markers, constructed of platinum, are sewn onto the stent graft to aid in visualization of the stent graft under fluoroscopy and to facilitate accurate placement of the device. Refer to **Figure 1** for an overview of stent graft components.

The stent graft is designed to be placed in the native vessel such that the unconstrained stent graft diameter is larger than the diameter of the native vessel into which it is to be placed. This "oversizing" helps to exclude the aneurysm from aortic blood flow and to ensure the stent graft is held in place. The amount of oversizing required is dependent on the diameter of the native vessel.

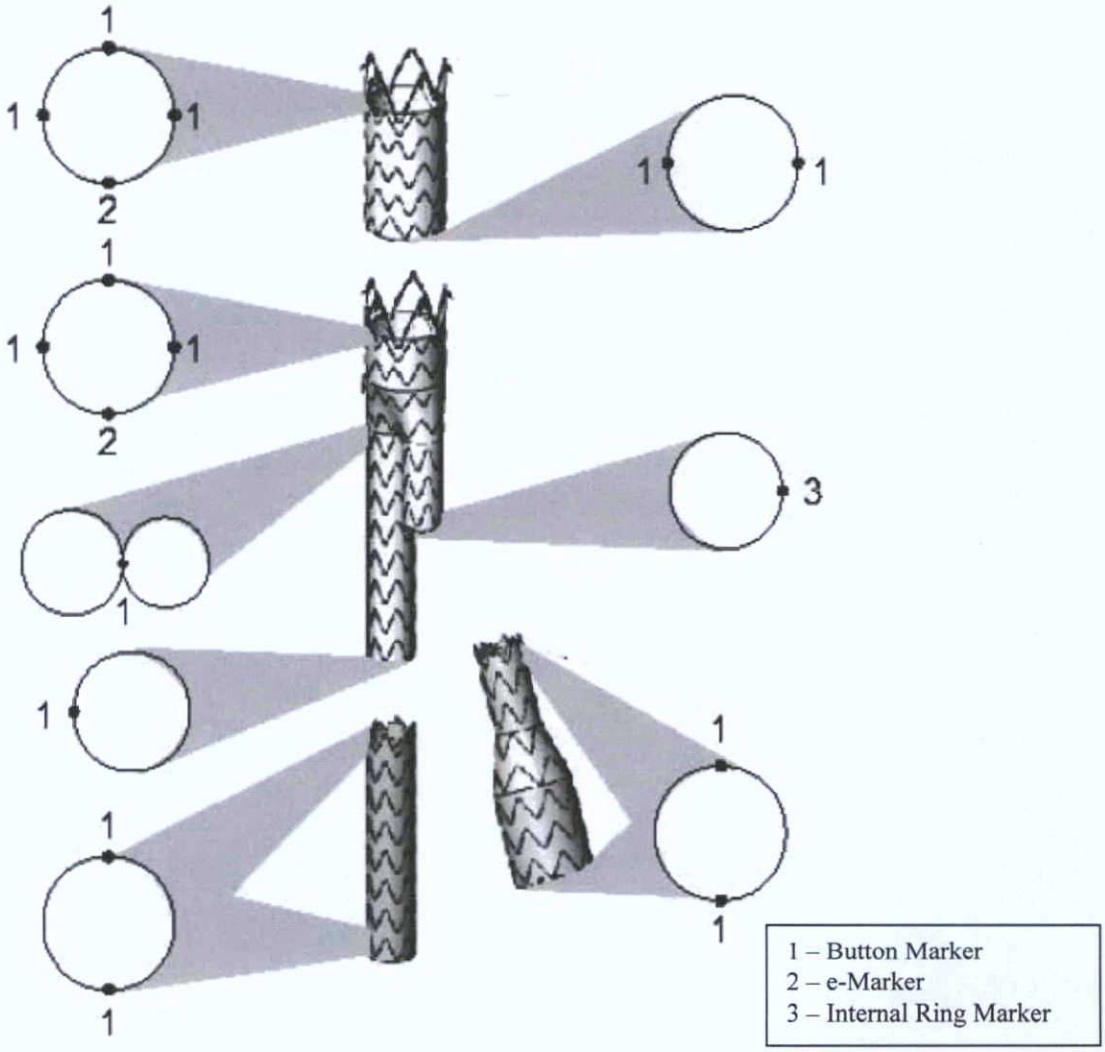


Figure 1: Endurant Stent Graft Configurations
Note: Graphic representation is not shown to scale

B. Bifurcated Stent Graft Component

The bifurcated stent graft component (refer to **Figure 2**) is the primary component which is inserted into the patient's aorta. The proximal section of the bifurcated stent graft component is deployed into the proximal neck and upper section of the aneurysm. The stent graft bifurcates into two smaller tubes: an ipsilateral iliac limb and a short contralateral leg.

The bifurcated component is available in proximal diameters ranging between 23 and 36 mm, with covered lengths ranging between 124 and 166 mm.

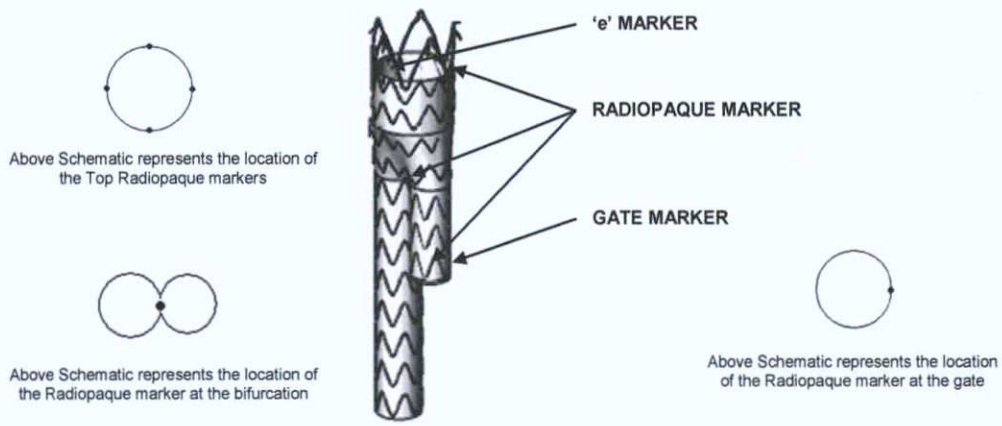


Figure 2: Endurant Bifurcated Stent Graft Component

C. Contralateral Limb Component

The contralateral limb component is deployed once the bifurcated component has been implanted, providing a conduit for blood flow into the contralateral iliac artery (refer to **Figure 3**). The proximal end of the contralateral limb component is deployed within the short contralateral leg of the bifurcated stent graft component. The contralateral limb component is available in distal diameters ranging between 10 and 28 mm, with covered lengths between 82 and 124 mm.

The proximal diameter is 16 mm for all sizes of contralateral limbs and is the same for all sizes, thus ensuring that this component can dock with all available bifurcated stent graft configurations.

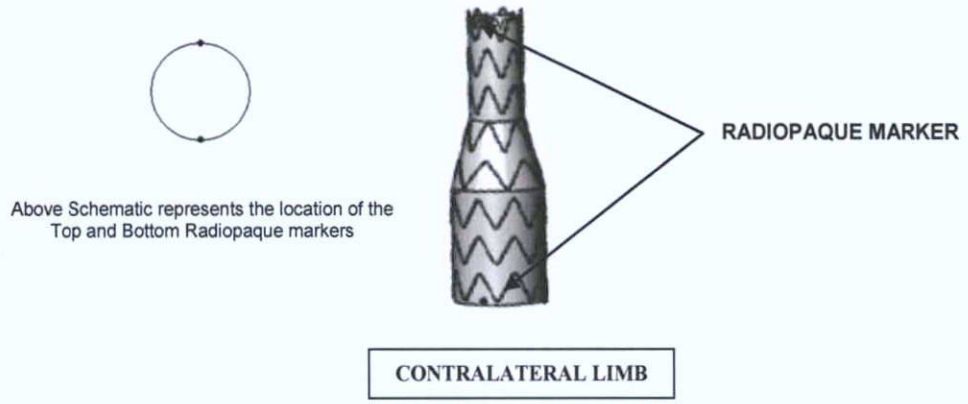


Figure 3: Endurant Contralateral Limb Component

D. Iliac Extension Component

In cases where additional distal length of the stent graft is needed, iliac extension components are available (refer to **Figure 4**). The iliac extension component is available in distal/proximal diameters ranging between 10 and 28 mm, with a covered length of 82 mm.

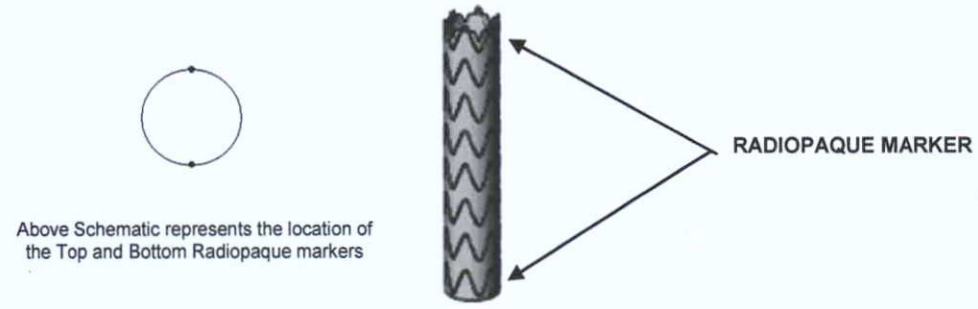


Figure 4: Endurant Iliac Extension Component

E. Aortic Extension Component

In cases where additional proximal length of the stent graft is needed, the aortic extension component is available. The aortic extension component (refer to **Figure 5**) is available in distal/proximal diameters ranging between 23 and 36 mm, with covered lengths of 49 mm or 70 mm.

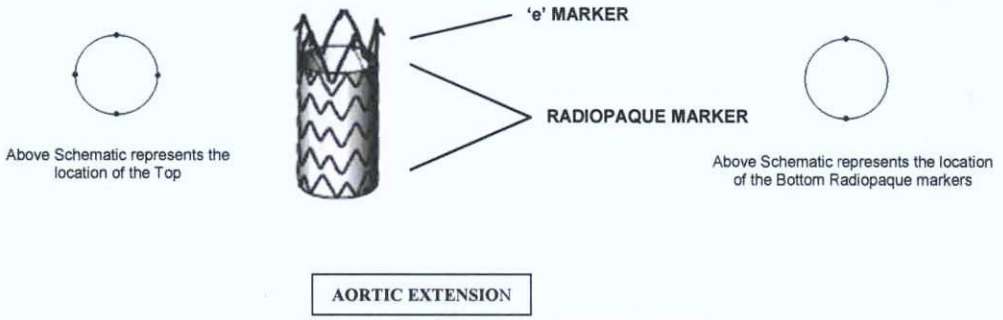


Figure 5: Endurant Aortic Extension Component

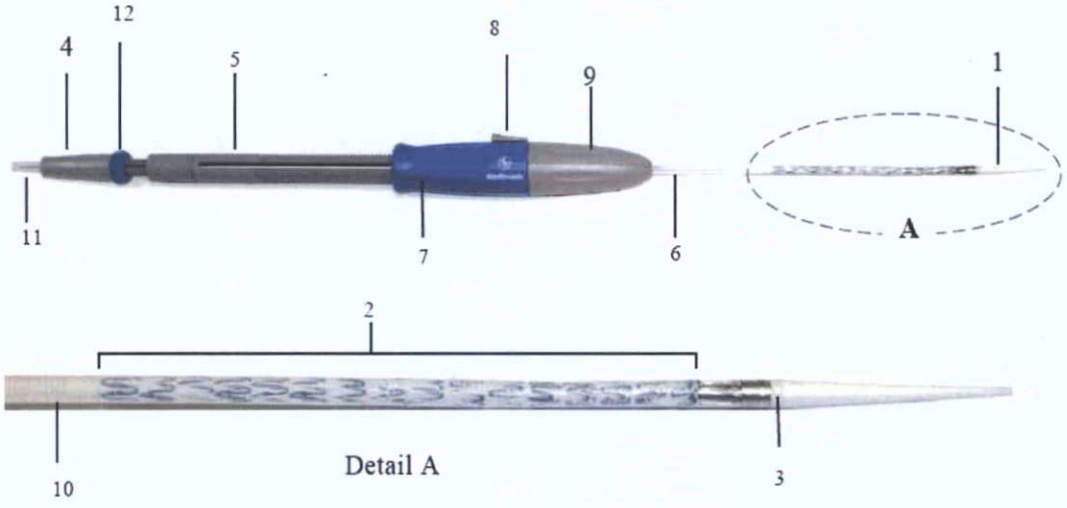
F. Endurant Delivery System

The Endurant Delivery System, which constrains the Endurant Stent Graft, facilitates the placement of the stent graft via the arterial vasculature (e.g., femoral arteries). Using fluoroscopic guidance, the delivery system is properly positioned within the patient's vasculature and the stent graft is deployed. There are two kinds of Endurant Delivery Systems: the Endurant Aortic Delivery System and the Endurant Iliac Delivery System. The Endurant Aortic Delivery System delivers the Endurant stent graft components containing anchor pins (i.e. bifurcated and aortic extension) and has a tip capture mechanism and a thumb wheel. The Endurant Iliac Delivery System delivers Endurant stent graft components that do not have anchor pins (i.e. contralateral limb and iliac extensions). The Iliac Delivery System does not contain a tip capture mechanism or a thumb wheel.

G. Endurant Aortic Delivery System

The Endurant Aortic Delivery System is available in an outer diameter of 18 and 20 French. The working length of the Endurant Aortic Delivery System is 57cm +/- 2 cm and the total length is 120 +/- 3 cm.

A pictorial representation of the Endurant Aortic Delivery system is provided in the figure below (refer to **Figure 6**).



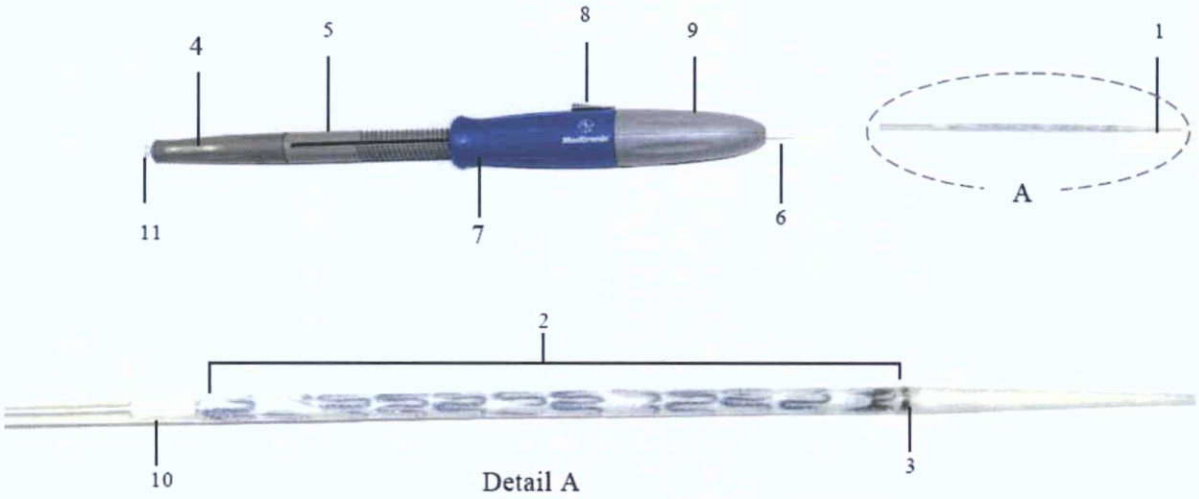
#	Components	#	Components
1	Tip Capture Assembly	8	Trigger
2	Graft Cover	9	Front Grip
3	RO Marker Band	10	Stent Stop
4	Rear Handle	11	Back End T-Tube
5	Screw Gear	12	Thumb Wheel
6	Strain Relief		
7	Slider		

Figure 6: Endurant Aortic Delivery System

H. Endurant Iliac Delivery System

The Endurant Iliac Delivery System is available in an outer diameter of 14, 16 and 18 French. The working length of the Endurant Iliac Delivery System is 57cm +/- 2 cm and the total length is 109 +/- 3 cm.

A pictorial representation of the Endurant Iliac Delivery system is provided in the figure below (refer to **Figure 7**).



#	Components	#	Components
1	Taper Tip	8	Trigger
2	Graft Cover	9	Front Grip
3	RO Marker Band	10	Stent Stop
4	Rear Handle	11	Back End T-Tube
5	Screw Gear		
6	Strain Relief		
7	Slider		

Figure 7: Endurant Iliac Delivery System

VI. Alternative Practices and Procedures

There are several other alternatives for the treatment of abdominal aortic aneurysms (AAA): endovascular repair using another endovascular grafting system; surgical implantation of a synthetic graft within the aneurysmal vessel; and medical management. Each alternative has its own advantages and disadvantages. The physician should fully discuss these alternatives with his/her patient to select the method that best meets expectations and lifestyle.

VII. Marketing History

The current version of the Endurant Stent Graft System has been commercially available since March 2010 outside the United States. The Endurant Stent Graft System has not been withdrawn from any market for reasons related to safety or effectiveness.

VIII. Potential Adverse Effects of the Device on Health

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

- Amputation
- Anesthetic complications and subsequent attendant problems (e.g. aspiration)
- Aneurysm enlargement
- Aneurysm rupture and death
- Aortic damage, including perforation, dissection, bleeding, rupture and death
- Arterial or venous thrombosis and/or pseudoaneurysm
- Arteriovenous fistula
- Bleeding, hematoma or coagulopathy
- Bowel complications (e.g., ileus, transient ischemia, infarction, necrosis)
- Cardiac complications and subsequent attendant problems (e.g. arrhythmia, myocardial infarction, congestive heart failure, hypotension, hypertension)
- Claudication (e.g., buttock, lower limb)
- Death
- Edema
- Embolization (micro and macro) with transient or permanent ischemia or infarction
- Endoleak
- Fever and localized inflammation
- Genitourinary complications and subsequent attendant problems (e.g., ischemia, erosion, fistula, incontinence, hematuria, infection)
- Hepatic failure
- Impotence
- Infection of the aneurysm, device access site, including abscess formation, transient fever and pain
- Lymphatic complications and subsequent attendant problems (e.g., lymph fistula)
- Neurologic local or systemic complications and subsequent attendant problems (e.g., confusion, stroke, transient ischemic attack, paraplegia, paraparesis, paralysis)
- Occlusion of device or native vessel
- Pulmonary complications and subsequent attendant problems
- Renal complications and subsequent attendant problems (e.g., artery occlusion, contrast toxicity, insufficiency, failure)
- Stent graft: improper component placement; incomplete component deployment; component migration; suture break; occlusion; infection; stent fracture; graft twisting and/or kinking; insertion and removal difficulties; graft material wear; dilatation; erosion; puncture and perigraft flow
- Surgical conversion to open repair
- Vascular access site complications, including infection, pain, hematoma, pseudoaneurysm, arteriovenous fistula, dissection.
- Vascular spasm or vascular trauma (e.g., iliofemoral vessel dissection, bleeding, rupture, death)
- Vessel damage
- Wound complications and subsequent attendant problems (e.g., dehiscence, infection, hematoma, seroma, cellulitis)

IX. Summary of Preclinical Studies

A. Biocompatibility

Biocompatibility testing was conducted on the Endurant Stent Graft and the Endurant Delivery System to ensure that the finished device is safe and biocompatible. Testing was performed in accordance with ISO 10993-1, and Jimurenraku No. 36 (Japan-specific biocompatibility tests as specified by Japan's Ministry of Health, Labour, and Welfare (MHLW)). The Endurant Stent Graft was categorized as an implant device with permanent blood contact (>30 days). The Endurant Delivery System was categorized as an external communicating device in limited contact with circulating blood (<24 hours). All testing performed met the requirements as specified within the applicable standard.

Table 1: Summary of Biocompatibility Testing – Endurant Stent Graft

Test	Purpose	Results	Acceptance Criteria Met (Y/N)
MHLW Cytotoxicity, Colony Assay	To evaluate the toxicity of the test article when exposed to Chinese Hamster Lung (V79) cells by determining the potential of the test article to inhibit colony formation in V79 cells.	The test article was not cytotoxic. There was no IC_{50} value for the test extract since toxicity was not observed.	Yes
ISO MEM Elution, Cytotoxicity	To determine whether leachables extracted from the test material would cause cytotoxicity when exposed to L-929 mouse fibroblast cells.	Test article extract: Grade 0 (no reactivity)	Yes
ISO Maximization Sensitization	To evaluate the allergenic potential or sensitizing capacity of the test article upon exposure to guinea pigs.	All test animals were grade 0 (no visible change) resulting in 0% sensitized.	Yes
MHLW Maximization Sensitization	To evaluate the potential for the test article to cause dermal sensitization.	Test Extract Concentrations (100%, 50%, and 25%): All test animals were grade 0.	Yes
ISO Intracutaneous Reactivity	To evaluate the test article for potential irritation effects as a result of an intracutaneous injection in New Zealand White rabbits.	Difference between test article and corresponding control: Saline: 0.0 Cottonseed Oil: 0.0	Yes
MHLW Acute Systemic Toxicity	To evaluate the test article for the potential for toxic effects after a single-dose systemic injection into mice.	Test animals did not exhibit greater biological reaction than the corresponding negative control group.	Yes
Material Mediated Pyrogen Study	To evaluate the test article for the potential of inducing a pyrogenic response in rabbits.	Temperature increases: 0.0°C, 0.0°C, and 0.0°C.	Yes
4-wk Sub-Chronic Toxicity Study following Subcutaneous Implantation	To determine the subchronic toxicity potential of the test article following subcutaneous implantation in rats for 4 weeks.	Test animals did not demonstrate any differences that were attributed to the test article when compared to control animals. Bioreactivity Rating = 1.9 (mild reaction)	Yes
In-vitro Reverse Mutation Assay *S. typhimurium* and *E. coli*	To evaluate the potential of the test article to induce reverse mutation in histidine (his^- to his^+) and tryptophan ($tryp^-$ to $tryp^+$) genes in *S. typhimurium* and *E. coli*, respectively.	A statistically significant increase in the number of revertant colonies was not observed with the test article.	Yes
In-vitro Chromosomal Aberration	To evaluate the potential of the test article to induce chromosome aberrations, structural or numerical, in Chinese Hamster Ovary (CHO) cells in the presence or absence of an exogenous mammalian metabolic activation system.	A statistically significant increase in the number of structural chromosomal aberrations was not observed with the test article.	Yes

Test	Purpose	Results	Acceptance Criteria Met (Y/N)
In-vivo Rodent Bone Marrow Micronucleus Assay	To evaluate the potential of the test article to induce damage to the chromosomes or mitotic apparatus in mouse bone marrow cells.	A statistically significant increase in the number of micronucleated PCEs was not observed with the test article.	Yes
12-week ISO Muscle Implantation	To evaluate the potential of the test article to induce local toxic effects after implantation in the muscle tissue of 3 rabbits for 12 weeks.	Test implant sites did not demonstrate any significant difference as compared to the control implant sites. Bioreactivity Rating = 1.5 (no reaction)	Yes
MHLW *in-vitro* Hemolysis	To evaluate the hemolytic activity of the test article when in contact with rabbit blood.	% Hemolysis for test extracts: 1 hour: 0.11% 2 hours: 0.00% 4 hours: 0.00%	Yes
ISO Unactivated Partial Thromboplastin Time Assay	To measure the effect of the test article on the clotting time of human plasma.	Average clotting time of the test article was not significantly decreased or increased compared to both negative controls.	Yes
Complement Activation Assay, C3a and SC5b-9	To measure complement activation in human plasma as a result of exposure of the plasma to the test article.	Concentration of C3a and SC5b-9 in the test extract was not significantly greater compared to both negative and plasma controls.	Yes
ISO *in-vitro* Hemocompatibility Assay	To show that the test article did not adversely affect selected hematological parameters of human blood. The hematological parameters tested were complete blood count including platelets, hematocrit, and erythrocyte indices.	No statistically significant difference between the test extract and both negative controls in any of the hematological parameters challenged.	Yes
In-vivo Thrombogenicity	To evaluate the potential of the test article to resist thrombus formation when placed in the vasculature of sheep.	Animal 660: Score 1 (minimal thrombosis) Animal 656: Score 0 (no thrombosis) Animal 653: Score 1 (minimal thrombosis)	Yes

Table 2: Summary of Biocompatibility Testing – Endurant Delivery System

Test Performed	Purpose	Results	Acceptance Criteria Met (Y/N)
MHLW Cytotoxicity, Colony Assay	To evaluate the toxicity of the test article when exposed to Chinese Hamster Lung (V79) cells by determining the potential of the test article to inhibit colony formation in V79 cells	No significant difference in colony formation between the neat (100%) concentration of test extract compared to the negative control.	Yes
ISO Maximization Sensitization	To evaluate the allergenic potential or sensitizing capacity of the test article upon exposure to guinea pigs	All test animals were grade 0 (no visible change) resulting in 0% sensitized.	Yes
ISO Intracutaneous Reactivity	To evaluate the test article for potential irritation effects as a result of an intracutaneous injection into New Zealand White rabbits	Difference between test article and corresponding control: Saline: 0.0 Cottonseed Oil: 0.0	Yes
MHLW Acute Systemic Toxicity	To evaluate the test article for the potential for toxic effects after a single-dose systemic injection into mice	Test animals did not exhibit greater biological reaction than the corresponding negative control group.	Yes
Material Mediated Pyrogen Study	To evaluate the test article for the potential of inducing a pyrogenic response in rabbits	Temperature increases: 0.1°C, 0.0°C, and 0.0°C.	Yes

Test Performed	Purpose	Results	Acceptance Criteria Met (Y/N)
MHLW *in-vitro* Hemolysis	To evaluate the hemolytic activity of the test article when in contact with rabbit blood	% Hemolysis for test extracts: 1 hour: 0.11% 2 hours: 0.00% 4 hours: 0.00%	Yes
ISO Unactivated Partial Thromboplastin Time Assay	To measure the effect of the test article on the clotting time of human plasma.	Average clotting time of the test article was not significantly decreased or increased compared to both negative controls.	Yes
Complement Activation Assay, C3a and SC5b-9	To measure complement activation in human plasma as a result of exposure of the plasma to the test article.	Concentration of C3a and SC5b-9 in the test extract was not significantly greater compared to both negative and plasma controls.	Yes
ISO *in-vitro* Hemocompatibility Assay	To show that the test article did not adversely affect selected hematological parameters of human blood. The hematological parameters tested were complete blood count including platelets, hematocrit, and erythrocyte indices.	No statistically significant difference between the test extract and both negative controls in any of the hematological parameters challenged.	Yes
In-vivo Thrombogenicity	To evaluate the potential of the test article to resist thrombus formation when placed in the vasculature of sheep.	Animal 660: Score 1 (minimal thrombosis) Animal 656: Score 0 (no thrombosis) Animal 653: Score 1 (minimal thrombosis)	Yes

B. Sterilization, Packaging and Shelf Life

The Endurant Stent Graft System is a single-use device that is provided sterile to the end user. The Endurant Stent Graft System is sterilized using E-Beam sterilization and is validated to demonstrate a Sterility Assurance Level (SAL) of 10^{-6}. Packaging performance and stability testing demonstrate that the packaging designs for the Endurant Stent Graft System are sufficient to adequately protect the device and maintain the integrity of the Endurant Stent Graft System package throughout its 2-year shelf-life claim.

Shelf-life testing results are presented alongside the *in-vitro* bench test results as part of **Table 3**. Accelerated shelf-life product testing conducted on the Endurant Stent Graft supports a 2-year shelf-life claim.

C. Laboratory Studies

Bench Testing

Medtronic conducted comprehensive preclinical, bench and analytical testing on the Endurant Stent Graft System. The *in vitro* testing was intended to verify that the performance attributes of the Endurant Stent Graft System are sufficient to minimize adverse events under anticipated clinical conditions. This testing included both the stent graft and the delivery system. All testing was conducted in accordance with national and international standards and guidance documents. The testing details include results from T=0 (baseline) as well as results using samples accelerated aged to 2 years (T=2). An asterisk (*) indicates testing was performed at both T=0 and T=2. Testing verified that the Endurant Stent Graft System (implant and delivery systems) met its product performance and design specifications.

Results obtained from *in vitro* testing provided evidence supporting the safety and effectiveness of the Endurant Stent Graft System.

Table 3: Endurant Stent Graft System Testing

***In Vitro* Test**	**Test Purpose**	**Acceptance Criteria**	**Results**
Stent Graft Design Verification testing			
Stent Graft Dimensional Verification *	Confirm that the outer diameter and covered length of the Endurant Stent Graft recovers within the specification after deployment from the Endurant Delivery System	• Diameter Tolerances (except 10.0 mm) = ± 1.0 mm • 10.0 mm Diameter Tolerance = +1.0/-0.5 mm • Covered length Tolerances = +5.0/- 10.0 mm	PASS
Stent Graft Visual Expansion Integrity *	Evaluate any damage that occurs to the Endurant Stent Graft after deployment from the Endurant Delivery System	• No broken stents and no visual stent deformation. • Loose sutures are allowable if they maintain stent or RO marker attachment to the graft material with a minimum allowable density of 5 sutures/cm. • Graft hole diameter < 0.50 mm	PASS
Suprarenal Stent Inspection *	Determine whether the suprarenal stents of the Endurant Bifurcated Stent Graft maintain visual and dimensional integrity after deployment from the Endurant Delivery System	• No anchor pin dimensional changes • No cracks, broken stents, gouges or indentations of the suprarenal stent	PASS
Stent Graft Migration Force	Measure the peak tensile securement force of active fixation anchor pins of the Endurant Stent Graft. The peak tensile securement force is indicative of the stent graft's ability *in vivo* to resist (oppose) distal migration	• 23mm Endurant Migration resistance force > 6.72 N • 25mm Endurant Migration resistance force > 8.10 N • 28mm Endurant Migration resistance force > 10.45 N • 32mm Endurant Migration resistance force > 13.12 N • 36mm Endurant Migration resistance force > 17.13 N	PASS
Endurant Stent Graft Migration Resistance Characterization Using Bovine Aorta	Characterize the Endurant Stent Graft migration resistance in simulated clinical conditions utilizing harvested bovine aorta	Since this test is for characterization only, there are no acceptance criteria.	NA
Graft Longitudinal Tensile Strength*	Determine the longitudinal tensile strength of the graft fabric of the Endurant Stent Graft	• Lower tolerance limit (LTL) > upper tolerance limit (UTL) of the Deployment Force • LTL > UTL Migration Resistance Force	PASS

In Vitro Test	Test Purpose	Acceptance Criteria	Results
Stent Graft Seal Evaluation	Compare the proximal seal performance of the Endurant and Talent Stent Grafts	Seal performance of Endurant > seal performance of Talent	PASS
Stent Graft Joint Strength	Measure the joint strength between modular components of the Endurant Stent Graft	• Joint Strength between Bifurcated Stub Leg and Contralateral Limb > 3.3 N • Joint Strength between a 28mm Iliac Limb and 28mm Iliac Extension > 5.73 N • Joint Strength between a 10mm Iliac Limb and 10mm Iliac Extension > 0.92 N	PASS
Stent Attachment Tensile Strength	Measure the tensile strength of the stent attachment to the stent graft of the Endurant Stent Graft	For Proximal Stent: Stent Attachment Strength > Deployment Force For Body Stent: Stent Attachment Strength > 33.36 N & Stent Attachment Strength > 50% of Deployment Force	PASS
Stent Graft Permeability	Determine the rate of water leakage through the entire stent-graft wall	UTL < 700 ml/min/cm^2 @ 120 mmHg	PASS
Aortic Body and Limb Flexibility *	Characterize the degree of flow occlusion occurring in the aortic body when placed at an aortic neck angle of 75° and in aortic limbs when placed at an angle of 90° of the Endurant Stent Graft	Aortic Body Flexibility: LTL Suprarenal Cross-sectional Area at 75° > 50.00% Area at 0° Iliac Limb Flexibility: LTL Cross-sectional Area at 90° > 50.00% Area at 0°	PASS
Stent Crimp Strength	Measure the crimp connecting sleeve tensile strength of the stent rings of the Endurant Stent Graft	Ultimate Tensile Strength > 8.90 N	PASS
Stent Radial Force	Measure the radial force exerted by the suprarenal and proximal stents ("fixation zone") of the Endurant Stent Graft	Endurant Proximal Fixation Zone Radial Force (N/mm) > 0 N/mm	PASS
Finite Element Analysis	Quantify the maximum fatigue strains occurring in the nitinol stents under crimp strain and *in vivo* loading conditions. Furthermore, use fatigue life data to present estimates of fatigue safety factors.	The safety factors based on the endurance limit should be > 1. The endurance limit was based upon experimentally measured estimates of nitinol fatigue life at 100 million cycles.	PASS
Stent Radial Fatigue	Evaluate the fatigue performance of the Endurant stent graft during a 10 year simulation consisting of 400 million cycles of accelerated *in vitro* testing in a compliant conduit	Each test sample must complete 400 million test cycles of radial dilatation testing at physiologically challenging radial distension parameters without a stent fracture	PASS
Whole Device Pulsatile Fatigue	Evaluate the fatigue wear characteristics of the Endurant Stent Graft System in the unsupported vessel region during a 10 year simulation consisting of 400 million cycles of accelerated *in vitro* testing.	Each test sample must complete 400 million cycles of pulsatile fatigue testing without a stent fracture. Graft material and suture durability characterized and compared to wear from clinically explanted specimens.	PASS
Angulated Longitudinal Fatigue	Evaluate the long-term durability of the Endurant stent graft when subjected to cyclic longitudinal deformations during a 10 year simulation	Each test sample must complete 400 million cycles of longitudinal fatigue testing without a stent fracture. Graft material and suture durability characterized and compared to wear from clinically explanted specimens.	PASS
Anchor Pin Asymmetric Fatigue	Evaluate the fatigue performance of the Endurant suprarenal anchor pins during a 10 year simulation consisting of 400 million cycles of accelerated *in vitro* testing.	Each test sample must complete 400 million test cycles within test specification without a test fracture or an abnormality	PASS

In Vitro Test	Test Purpose	Acceptance Criteria	Results
Angulated Neck Fatigue	Evaluate the long-term durability of the Endurant Stent Graft when deployed within an angulated neck	Each test sample must complete 400 million cycles of fatigue testing without separation of the suprarenal stent from the stent graft body or stent fractures. Graft material and suture durability characterized and compared to wear from clinically explanted specimens.	PASS
Overlap Fatigue	Evaluate the fatigue performance of two overlapping Endurant stent grafts during a 10 year simulation consisting of 400 million cycles of accelerated *in vitro* testing in a compliant conduit.	Each test sample must complete 400 million test cycles of radial dilatation testing at physiologically challenging radial distension parameters without a stent fracture. Graft material and suture durability characterized and compared to wear from clinically explanted specimens.	PASS
Stent Graft Corrosion Testing	Evaluate the corrosion resistance properties of Endurant nitinol laser-cut and wire formed stents.	The stent breakdown potential shall not be lower than the *in vivo* biologically relevant rest potential.	PASS
Delivery System Verification Testing			
Delivery System Hemostasis – Before and After Tip Removal*	Determine the ability of the End Seal Plug, Backend T-tube, and valves of the Endurant Delivery System to maintain an adequate hemostatic seal before and after tip removal	Flow rate < 2 cc/min	PASS
Taper Tip to Inner Member Bond Tensile*	Measure the tensile strength of the Taper Tip to Inner Member bond of the Endurant Delivery System	LTL > 66.72 N LTL > UTL Tip Advancement Force	PASS
Sleeve/Taper Tip Bond Strength (Aortic Delivery System) *	Measure the tensile strength of the Over-Molded Taper Tip to Sleeve bond of the Endurant Delivery System	LTL > 66.72 N LTL > UTL Tip Advancement Force	PASS
Spindle/ Spindle tube Bond Strength (Aortic Delivery System)	Measure the tensile joint strength of the Spindle to Spindle Hypotube of the Endurant Delivery System	LTL > 66.72 N LTL > UTL Deployment Force LTL > UTL Tip Advancement Force	PASS
Spindletube/Middle Member Bond Strength (Aortic Delivery System) *	Determine the tensile force required to break the Middle Member - Spindle Hypotube bond of the Endurant Delivery System	LTL > 66.72 N LTL > UTL Deployment Force LTL > UTL Tip Advancement Force	PASS
Handle/T-Tube Bond Strength *	Determine the ultimate tensile strength of the T-Tube Assembly of the Endurant Delivery System	LTL > 66.72 N LTL > UTL Deployment Force	PASS
Backend T-Tube Bond Strength *	Measure the tensile strength of the Inner Member to Back-End T-Tube bond of the Endurant Stent Delivery System	LTL > 66.72 N LTL > UTL Tip Advancement Force (Aortic only)	PASS
Graft Cover Tensile Strength * (PEBAX, Vestamid and Joint section)	For the Endurant Delivery System Graft Cover Tubing Assembly, this test determined the unrecovered strain at specified proof loads for the PEBAX and Vestamid / PEBAX joint sections and the load at yield (offset 0.8%) of the Vestamid section.	Graft cover tensile strength > greater of pre-determined proof load or deployment force.	PASS
Handle T-Tube Torsion Strength *	Evaluate the torsional strength of the handle T-Tube assembly bond between the graft cover tubing and the handle T-Tube of the Endurant Delivery System	For 18 Fr Endurant Delivery Systems: Torsion Bond Strength LTL > 0.23 N-m For 20 Fr Endurant Delivery Systems: Torsion Bond Strength LTL > 0.37 N-m	PASS

In Vitro Test	Test Purpose	Acceptance Criteria	Results
Spindle Hypotube to Middle Member Torsion Strength (Aortic Delivery System) *	Measure the torque force required to break the bond between the Spindle Hypotube and Middle Member of the Endurant Delivery System	LTL Torsion Bond Strength > 0.15 N-m	PASS
Backend T-Tube Torque – Inner Member Torque Strength *	Measure the torque force required to break the bond between the backend T-Tube and Inner Member on the Endurant Delivery System	LTL Torsion Bond Strength > 0.04 N-m	PASS
Spindle Hypotube Torque-Tensile (Aortic Delivery System) *	Measure the tensile force required to break the skip-cut portion of the Spindle Hypotube of the Endurant Delivery System after each Spindle Hypotube has withstood 540° of torque.	• LTL Spindle Hypotube Tensile Strength > UTL Tip Advancement Force • LTL Spindle Hypotube Tensile Strength >66.72 N • LTL Spindle Hypotube Tensile Strength > UTL Deployment Force	PASS
Middle Member Lock Tensile Strength *	Measure tensile strength of the bond between the Middle Member Locks and Middle Member of the Endurant Delivery System	• LTL Tensile Strength > UTL Tip Advancement Force • LTL Tensile Strength > 66.72 N • LTL Tensile Strength > UTL Deployment Force	PASS
RO Marker Band Tensile Strength *	Measure the tensile strength of the bond between the radiopaque marker band and the graft cover on the Endurant Delivery System	• LTL Tensile Strength > 33.36 N • LTL Tensile Strength > ½ of UTL Deployment Force	PASS
T-Tube Hubcap Bond Strength *	Measure the tensile strength of the bond between the hubcap and handle T-Tube of the Endurant Delivery System	LTL Tensile Strength > 2.22 N	PASS
Endseal to Hypotube Bond Tensile Strength*	Measure the tensile strength of the bond between the End Seal and Hypotube of the Endurant Delivery System	LTL Tensile Strength > 2.22 N	PASS
Forward Wheel Wall Torque Strength *	Measure the forward torque force at the wall of the rear grip required to separate the wheel from the screwgear of the Endurant Stent Graft System with Design Improvements	LTL > 0.62 N-m	PASS
Working and Total Length *	Determine the working and total lengths of the Endurant Delivery System	Working Length 57 ± 2 cm Total Length Aortic delivery system: 120 ± 3 cm Iliac delivery system: 109 ± 3 cm	PASS
Crossing Profile *	Determine the outside diameter of the Endurant Delivery System	The appropriate ring gage must pass over the loaded delivery system without any damage to the delivery system.	PASS
Guidewire Acceptance*	Confirm that the Endurant Delivery System is compatible with a 0.035" guidewire	The delivery system must pass a 0.035" guidewire with ≤100 gF of resistance	PASS
Deployment Force *	Determine the force to deploy the Endurant Stent Graft System within a simulated vasculature model	Deployment Force < Graft Cover Material's Yield Strength	PASS
Delivery System Lubricity (Hydrophilic Coating Presence) *	Determine the presence of hydrophilic coating on the Endurant Delivery System	Hydrophilic coating must be present on the graft cover	PASS
Trackability *	Evaluate the trackability of the Endurant Stent Graft System	The system must be able to track through simulated tortuous anatomies to reach the placement location	PASS
Pushability *	Evaluate the pushability of the Endurant Stent Graft System	The system must be able to be pushed through simulated tortuous anatomies to reach the placement location	PASS

In Vitro Test	Test Purpose	Acceptance Criteria	Results
Torquability *	Characterize the torquability of the Endurant Stent Graft System.	Since this test is for characterization only, there are no acceptance criteria	NA
Flex/Kink *	Evaluate the ability of the Endurant Stent Graft System to withstand flex/kink	The delivery system must resist kinking such that the stent graft can be deployed at the intended placement location	PASS
Graft Cover Torque*	Evaluate the graft cover torque capability of the Endurant Delivery System	The graft cover joint (PEBAX to Vestamid) must withstand torque forces during gate alignment such that stent graft deployment occurs successfully	PASS
Release of Anchor Pins (AP) (Aortic Delivery System) *	Determine the ability of the Endurant Stent Graft System to provide proper and timely release of the anchor pins in a simulated use model	All suprarenal apices must remain within the sleeve until the backend thumbwheel is advanced. The stent graft must successfully deploy.	PASS
Deployment Accuracy (Aortic Delivery System) *	Characterize the deployment accuracy of the Endurant Stent Graft System.	Since this test is for characterization only, there are no acceptance criteria.	NA
Ability to Withdraw (Aortic Delivery System) *	Determine the ability to withdraw the Endurant Delivery System post stent graft deployment	The operator must recapture the spindle and tapered tip, and the delivery system must be withdrawn, intact, from the simulated use model after stent graft deployment	PASS
Tip Advancement Force (Aortic Delivery System) *	Measure the force required to advance the tapered tip and deploy the anchor pins of the Endurant Stent Graft System	UTL < 88.96 N	PASS
Spindle Advancement	Measure the rate of release of the modified spindle used in the Endurant Aortic Stent Graft System	Kaplan-Meier survival statistically better than control, for rate of spindle release from the suprarenal stent.	PASS
Stent Graft Length vs. Diameter	Assess the length of the deployed Endurant Stent Graft as a function of diameter	UTL Actual Length – Deployed Length ≤ ±10% Actual Length	PASS

* Indicates tests performed at T=0 (baseline) and T=2 (accelerated aged shelf-life)

In vivo Animal Testing

Preclinical *in vivo* animal testing, using prototypes of the final device design, was conducted in 27 animals to evaluate acute technical success (deployment), stent graft integrity, and histopathological response of the Endurant Stent Graft System in ovine models for up to 6 months. The prototype design and the final device design are similar enough for the animal study results to be applicable to the final Endurant design. The results demonstrated the ability to access the target anatomical location, adequate handling and visualization of the delivery system and implant, and deployment accuracy. Stent graft integrity and histopathological response were acceptable. The results support the safety and expected performance of the Endurant Stent Graft System. A summary of the *in-vivo* animal testing is provided in **Table 4.**

Table 4: Summary of Endurant In-Vivo Studies

Study	# of Animals	Objectives	Success Criteria	Objectives Met?[1]
Acute Evaluation of Medtronic Vascular's Endurant Stent Graft System in an Ovine Model	6	Evaluate the following performance characteristics: ▪ Trackability/Flexibility of Endurant Delivery System ▪ Pushability/Kink resistance of Endurant Delivery System ▪ Torquability of Endurant Delivery System (Aortic Delivery System - for bifurcated and aortic cuff devices) ▪ Guidewire compatibility/Delivery system movement over the wire ▪ Crossing ability ▪ Deployment ▪ Visibility of system under fluoroscopy for both Endurant Stent Graft and Delivery System ▪ Accuracy of placement of Endurant Stent Graft ▪ Tip advancement of Endurant Aortic Delivery System ▪ Delivery system retraction and withdrawal ▪ Functional hemostasis of delivery system (back bleed) ▪ Post procedural inspection ▪ Ease of use	Successful completion of this study was defined as mean evaluation scores for each performance characteristic of component of the test device as being 'average' (rating "3") or greater.	Yes
Evaluation of Medtronic Vascular's Endurant Abdominal Stent Graft System's Bail Out Procedures in an Ovine Model	2	In the event the sleeve holding the apices of the proximal bare spring and anchor pins of the device is not able to be removed because of a delivery system failure, a bail-out procedure to effectively retract the system is necessary. The purpose of this study is to evaluate the acute performance of the Endurant Stent Graft System in the event of device failure. The capacity of the prosthesis to be effectively removed without significant damage will be investigated.	As this was an evaluation of a specific procedure for the Endurant Delivery System, no specific success criteria were established.	Yes

Study	# of Animals	Objectives	Success Criteria	Objectives Met?[1]
Evaluation of Medtronic Vascular's Endurant Abdominal Stent Graft System in an Ovine Model (30-Day Safety Study)	7	▪ Assess acute stent graft placement and any device related effects at the time of implant. ▪ Evaluation of the position of the implant at the time of explant ▪ Evaluation of the structural integrity of the Endurant Abdominal Stent Graft at the time of explant ▪ Evaluation of histology and pathology of explants and surrounding tissue	▪ Distal migration of the test devices of no more than 10 mm will be considered acceptable. Position of the stent graft at implant and explant will be compared using anatomical landmarks, aortagrams and intravascular ultrasound (IVUS) and any change in position will be documented. ▪ Evaluation of the structural integrity of the Endurant Abdominal Stent Graft at the explant procedure, before animal termination, will be evaluated using angiography, IVUS and/or x-ray. Success will be determined by the lack of evidence of stent fractures. ▪ Comparable or superior histological indicators of vessel wall healing at 30 days for Endurant Abdominal Stent Graft test devices as compared to the Talent Abdominal Stent Graft control data, including strut induced vessel wall injury, and inflammation. ▪ Overall quantitative morphometric analysis of tissue sections from the test device indicating similar or better response than the Talent control data.	Yes
Evaluation of Medtronic Vascular's Endurant Abdominal Stent Graft System in an Ovine Model (90-Day Safety Study)	6	▪ Assess acute stent graft placement and any device related effects at the time of implant. ▪ Evaluation of the position of the implant at the time of explant ▪ Evaluation of the structural integrity of the Endurant Abdominal Stent Graft at the time of explant ▪ Evaluation of histology and pathology of explants and surrounding tissue	▪ Distal migration of the test devices of no more than 10 mm will be considered acceptable. Position of the stent graft at implant and explant will be compared using anatomical landmarks, aortagrams and intravascular ultrasound (IVUS) and any change in position will be documented. ▪ Evaluation of the structural integrity of the Endurant Abdominal Stent Graft at the explant procedure, before animal termination, will be evaluated using angiography, IVUS and/or x-ray. Success will be determined by the lack of evidence of stent fractures. ▪ Comparable or superior histological indicators of vessel wall healing at 90 days for Endurant Abdominal Stent Graft test devices as compared to the Talent Abdominal Stent Graft control data, including strut induced vessel wall injury, and inflammation. ▪ Overall quantitative morphometric analysis of tissue sections from the test device indicating similar or better response than the Talent control data.	Yes

Study	# of Animals	Objectives	Success Criteria	Objectives Met?[1]
Evaluation of Medtronic CardioVascular's Endurant Stent Graft System in an Ovine Model (180-Day Safety Study)	6	▪ Assess acute stent graft placement and any device related effects at the time of implant. ▪ Evaluation of the position of the implant at the time of explant ▪ Evaluation of the structural integrity of the Endurant Abdominal Stent Graft at the time of explant ▪ Evaluation of histology and pathology of explants and surrounding tissue	▪ Ability to deliver and deploy all stent grafts to the intended location. ▪ Distal migration of the test devices of no more than 10 mm will be considered acceptable. Position of the stent graft at implant and explant will be compared using anatomical landmarks, aortagrams and intravascular ultrasound (IVUS) and any change in position will be documented. ▪ Evaluation of the structural integrity of the Endurant Abdominal Stent Graft at the explant procedure, before animal termination, will be evaluated using angiography, IVUS and/or x-ray. Success will be determined by the lack of evidence of stent fractures. ▪ Comparable or superior histological indicators of vessel wall healing at 180 days for Endurant Abdominal Stent Graft test devices as compared to the Talent Abdominal Stent Graft control data, including strut induced vessel wall injury, inflammation, thrombus, endothelialization, and neointimal formation. ▪ Overall quantitative morphometric analysis of tissue sections from the test device indicating similar or better response than the Talent control data.	Yes

[1] Please note that some degree of change in device position that may have exceeded 10 mm was noted in some cases upon radiographic or IVUS measurement with respect to either the control device or radiographic anatomic landmarks. However, these measurements are not necessarily reliable because of issues with parallax error that arose either from difficulties in reproducing the exact position of the animal on the table or due to some degree of animal weight gain over the in-life period of the study.

X. Summary of Clinical Studies

The Endurant Stent Graft System US Clinical Study (G070208; also referenced as the Endurant Stent Graft System US IDE) information summarized below includes the clinical safety and effectiveness data. Data on 150 subjects were available at 30-days post-index procedure and data on 129 subjects were available at 12-months post index procedure. The 30-day and 1-year data set was provided to support the marketing application of the Endurant Stent Graft System. The aforementioned trial is summarized in **Table 5**. The trial under which the historical control data were captured is summarized in **Table 6**.

Table 5: Endurant Stent Graft System Clinical Study Summary – Test Group

Clinical Study	Study Design	Objective	Number of Sites	Number of Subjects (enrolled)
Endurant Stent Graft System Clinical Study	Prospective, non-randomized, multi-center study with a historical control	Evaluate the safety and effectiveness of the Endurant Stent Graft System	26	150 subjects

Table 6: Talent Abdominal Stent Graft System Clinical Study Summary - Historical Control

Clinical Study	Study Design	Objective	Number of Sites	Number of Subjects (enrolled)
Talent Abdominal Stent Graft System Pivotal Clinical Study	Prospective, non-randomized, multi-center stud; study was used as a historical control for Endurant US Clinical Study	Evaluate the safety and effectiveness of the Talent Abdominal Stent Graft System	13	166 subjects

A. Clinical Study Design

The Endurant Stent Graft System data presented as part of P100021 formed the basis for FDA's finding that the System is safe and effective for its intended use. A total of 150 patients were enrolled in the bifurcated study arm of the US Study. An independent core lab reviewed CT scans and abdominal x-rays to assess aneurysm changes, device position and integrity, and endoleaks.

The objective of the Endurant Stent Graft System US Clinical Study was to evaluate the safety and effectiveness of the Endurant Stent Graft System in the treatment of infrarenal abdominal aortic and aortoiliac aneurysms.

1.0 Major Design Characteristics of the Endurant Stent Graft System US Clinical Study

The US Clinical Study was an open label, non-randomized design. The Endurant Stent Graft System bifurcated arm (n = 150) was compared to a historical control, namely the Talent AAA Stent Graft System, a prior generation endovascular abdominal aortic aneurysm stent graft system. The Talent Control group (n = 166) was the pivotal cohort in the study of the Talent Abdominal Stent Graft (refer to the Summary of Safety and Effectiveness Data (SSED) for the Talent Abdominal Stent Graft System (P070027) for more information), where enrollment occurred at 13 sites between February 2002 and April 2003. The determination of the safety and effectiveness of Endurant Stent Graft System was based on the data collected in the first year post-implant. Additionally, Medtronic will continue to follow the patients enrolled in the US Clinical Study for a total of 5 years under the same clinical protocol.

2.0 Clinical Endpoints of the Endurant Stent Graft System US Clinical Study

The analysis included clinically relevant endpoints for patients with abdominal aortic disease. The endpoints used by Medtronic to demonstrate the safety of their device were adequate to describe the adverse events resulting from using the Endurant Stent Graft System. Similarly, the endpoints used by Medtronic to demonstrate the effectiveness of their device were adequate to demonstrate the treatment effect.

2.1 Safety

The primary safety endpoint for this analysis was the proportion of patients free from a Major Adverse Event (MAE) within 30 days of the index procedure (based on a composite MAE rate), compared to the Talent Control Group. Other secondary endpoints and analyses include all-cause mortality through 1 and 12 months, aneurysm-related mortality (ARM) through 12 months, and adverse events. All Major Adverse Events (MAEs) were adjudicated by an independent clinical events committee and study safety was monitored by a data safety monitoring committee. Follow-up visits were conducted at 1 month, 6 months, and 12 months to support the marketing application, and subjects will continue to be followed annually thereafter, for a total of 5 years from the index procedure.

2.2 Effectiveness

The primary effectiveness endpoint for this analysis was successful aneurysm treatment at one year. Successful aneurysm treatment was an endpoint that included successful delivery and deployment, aneurysm growth, endoleaks, stent graft occlusion, conversion to surgery, rupture and migration. Imaging-based events were assessed by an independent core laboratory. The primary effectiveness endpoints were compared to the Talent Control Group. Other secondary endpoints and analyses included each of the components of the composite endpoint and technical observations, defined as an observed effect or malfunction of the stent graft which is not related to any adverse event, through 12 months. Follow-up visits were conducted at 1 month, 6 months, and 12 months to support the marketing application and subjects will continue to be followed annually thereafter, for a total of 5 years from the index procedure.

2.3 Success/Failure Criteria

The Endurant Stent Graft System US Clinical Study was considered a success if both primary safety and effectiveness study objectives were met. These objectives were assessed by demonstrating non-inferiority of the Endurant Test Group to the Talent Control Group in regards to freedom from MAEs at 30 days and successful aneurysm treatment at 12 months following the index procedure, where non-inferiority was pre-specified with a quantifiable margin of 10%.

2.4 Pre-Specified Statistical Analysis Plan

The statistical analysis plan utilized for the Endurant Stent Graft System study was prospectively defined. Taking into consideration the Talent study results, expected attrition, and a goal of achieving at least a minimum of 80% statistical power at a one-sided significance level of 5%, a sample size of 150 enrolled subjects was considered to be sufficient using a 10% non-inferiority margin. The difference in outcomes was determined utilizing a propensity score method (stratification). The primary safety hypothesis was defined as the proportion of subjects free from the occurrence of a MAE within 1 month (Day 0 - Day 30) of the implantation of the Endurant Stent Graft. For statistical comparison of the primary safety endpoint between the Endurant and the Talent Control group, a non-inferiority hypothesis was tested. The primary effectiveness endpoint was an endpoint defined as the proportion of subjects who had a successful aneurysm treatment as evaluated at the time of the index procedure and at 12 months. For statistical comparison of the primary effectiveness endpoint between the Endurant and the Talent Control group, a non-inferiority hypothesis was tested. Results presented here are based on analysis using available data. A sensitivity analysis on the intent-to-treat population, including all patients enrolled, was performed using multiple imputation methods.

2.5 External Evaluation Groups

- *Core Laboratory.* In order to provide independent verification of imaging findings, images required by protocol were sent by the sites to a central imaging core laboratory with processes and systems that are GMP/GCP, HIPAA, and CFR 21 Part 11 compliant and are provided within an ISO 13485 certified facility which adheres to all applicable federal regulations.
- *Clinical Events Committee.* An independent Clinical Events Committee (CEC) adjudicated all deaths and MAEs for event type and device and procedure relatedness. Members included interventional cardiologists, vascular surgeons, cardiothoracic surgeons, and interventional radiologists who had no conflicts of interest related to the study sponsor or the study investigators.
- *Data Monitoring Committee.* An independent data monitoring committee (DMC) reviewed 30-day safety data at determined intervals during enrollment. Based on the safety data, the DMC could have recommended that Medtronic Vascular continue, modify, or stop the study in accordance to previously agreed parameters. The committee was composed of physicians with relevant training and one biostatistician who were not directly involved in the conduct of the study.

3.0 Study Design

Medtronic compared the Endurant Stent Graft System to the Talent Stent Graft System as part of the primary safety and effectiveness endpoint utilizing hypotheses. This study design generated valid scientific evidence by comparing the test group to an endovascular control group. This design provided the following advantages:

- the test and control subject populations were both treated by endovascular repair;
- both safety and effectiveness endpoints can be compared directly; and
- study entry criteria were comparable.

It is important to note that there are considerations associated with using a historical control, such as the Talent Stent Graft Control. Talent subjects were enrolled between 2002 and 2003, whereas Endurant subjects were enrolled between 2008 and 2009. Between the time that the two studies were conducted, the therapy has evolved and physicians became more experienced with the endovascular repair (EVAR) procedure. Also, unobserved differential characteristics between two cohorts cannot be adjusted. However, both populations were treated for abdominal aortic aneurysms and the results from the Talent Stent Graft Control group provide a valid control to compare with the Endurant Stent Graft System.

Since the initial enrollment, no significant changes were made to the Endurant Stent Graft System US Clinical Study design.

3.1 Clinical Inclusion and Exclusion Criteria

Enrollment in the Endurant Stent Graft System US Clinical Study was limited to patients who met the following selection criteria as shown in **Table 7**.

Table 7: Endurant Stent Graft System Inclusion and Exclusion Criteria

Inclusion	Exclusion
Subject is ≥ 18 years old.	Subject has a life expectancy ≤ 1 year
Subject (or Subject's legal representative) understands and voluntarily has signed and dated an Informed Consent document approved by the Sponsor and by the Institutional Review Board	Subject is participating in another investigational drug or device study and has not completed the follow-up required for that study at least 1 month prior to signing the consent form in this study
Subject is able and willing to comply with the protocol and undergo follow-up requirements	Subject is a female of childbearing potential in whom pregnancy cannot be excluded. A pregnancy test with negative results is required at the time of screening
Subject is a suitable candidate for elective surgical repair of AAA by as evaluated by American Society of Anesthesiologists (ASA) Physical Status Classification System I, II, or III	Subject has an aneurysm that is: a. Suprarenal. b. Isolated ilio-femoral. c. Mycotic. d. Inflammatory e. Pseudoaneurysm
Subject has an abdominal aortic or aortoiliac aneurysm characterized by one or more of the following: a. Aneurysm is > 5cm in diameter (diameter measured is perpendicular to the line of flow). b. Aneurysm is 4 - 5 cm in diameter and has increased in size ≥ 0.5 cm within the last 6 months	Subject has an untreated thoracic aneurysm > 4.5 cm in diameter

Inclusion	Exclusion
Subject meets all the following anatomical criteria as demonstrated on contrast enhanced CT or MRA imaging: a. Suprarenal angle ≤ 45 degrees (angle between the proximal neck and the suprarenal aorta). b. Infrarenal angulation ≤ 60 degrees (angle between the proximal neck and the aneurysm). c. Infrarenal aneurismal neck length with at least 10 mm of non-aneurismal aorta, immediately inferior to the most inferior major renal artery	Subject requires emergent aneurysm treatment, e.g., trauma or rupture
Subject has vascular dimensions, e.g., aortic and iliac diameters, lengths fromrenal arteries to iliac bifurcation and hypogastric arteries, in the range of sizes available for the Endurant Stent Graft and within the sizing recommendations	Subject has an aneurysm that involves the part of the aorta at the ostia of the renal arteries
Subject has a proximal aortic neck diameter ≥ 19 mm and ≤ 32 mm	Subject has a history of bleeding diathesis or coagulopathy
The distal fixation center of the iliac arteries must have a diameter ≥ 8 mm and ≤25 mm bilateral	Subject has had or plans to have an unrelated major surgical or interventional procedure within 1 month before or after implantation of the Endurant Stent Graft
Subject has documented imaging evidence of at least 1 patent iliac and 1 femoral artery, or can tolerate a vascular conduit that allows introduction of the device	Subject has had a myocardial infarction (MI) or cerebral vascular accident (CVA) within 3 months prior to implantation of the Endurant Stent Graft
Subject has distal non-aneurysmal iliac (cylindrical) fixation length ≥ 15 mm bilaterally	Subject has a reversed conical neck defined as a > 4 mm distal increase over a 10 mm length
	Subject has a known allergy or intolerance to the device components
	Subject has a known hypersensitivity or contraindication to anticoagulants, antiplatelets, or contrast media, which is not amenable to pre-treatment
	Subject has significant (> 25% of vessel circumference of aortic neck and iliac artery, and/or > 50% of the length of the iliac artery) aortic mural thrombus at either the proximal or distal attachment centers that would compromise fixation and seal of the device bilaterally
	Subject has ectatic iliac arteries requiring bilateral exclusion of hypogastric blood flow
	Subject whose arterial access site is not anticipated to accommodate the diameter of the Endurant Stent Graft Delivery System (14F-20F) due to size or tortuosity
	Subject is morbidly obese (body mass index ≥ 40 kg/m2) or has other documented clinical conditions that severely inhibit radiographic visualization of the aorta
	Subject has active infection at the time of the index procedure documented by pain, fever, drainage, positive culture and/or leukocytosis (WBC > 11,000 mm3) that is treated with antimicrobial agents (nonprophylactic)
	Subject has congenital degenerative collagen disease, e.g., Marfan's Syndrome
	Subject has a creatinine > 2.00 mg/dl (or > 182 µmol/L)
	Subject is on dialysis

Two different scoring systems were used to describe the comorbid state of patients (SVS in Talent and ASA in Endurant); however, a common grading system was applied to both study groups to provide a valid comparison (Modified SVS/AAVS Medical Co-morbidity Grading System). There are some differences in anatomical criteria based on device-specific stent graft sizes. Exclusion criteria in the Endurant Test Group included restrictions to ensure subject safety, such as exclusion of emergency aneurysm treatment, allergies to device, and elevated creatinine. More detailed or specific criteria were included in the Endurant study due to the advancement of the management of the disease. Since the Talent clinical study began in 2002, recommendations for EVAR and AAA management have evolved. Main differences between Endurant and Talent Inclusion/Exclusion Criteria are detailed in **Table 8**.

Table 8: Summary of Endurant vs. Talent Inclusion/Exclusion Criteria

Endurant	Talent
Inclusion Criteria	
Baseline Risk Factors	
ASA Physical Status Classification I, II and III	SVS/ISCVS category 0, 1 and 2
Anatomical Characteristics	
• AAA >5 cm in diameter or is 4-5 cm but increased in size ≥0.5 cm within last 6 months • Proximal AAA neck length ≥10 mm • Suprarenal ≤45 and infrarenal ≤60 degrees • Proximal aortic neck diameter ≥19 mm and ≤32 mm • Iliac diameters ≥8 mm and ≤25 mm	• AAA >4 cm in diameter or 1.5 times larger than native aorta or symptomatic • Proximal AAA neck length ≥5 mm* • Infrarenal ≤60 degrees • Proximal aortic neck diameter ≥14 mm and ≤32 mm • Iliac diameters ≥8 mm and ≤18 mm • Renal arteries ≥9 cm from aortic bifurcation
Exclusion Criteria	
Baseline Risk Factors	
• Untreated thoracic aneurysm > 4.5 cm diameter • Emergent aneurysm treatment (trauma, rupture) • Known allergy to device component • Creatinine ≥2.0 mg/dl (182µmol/L) • On dialysis	SVS/ISCVS category 3 or unsuitable for elective surgical repair
Anatomical Characteristics	
• Aneurysm that involves the part of the aorta at the ostia of the renal arteries • Reversed conical neck > 4mm distal increase over 10 mm length. • Significant aortic mural thrombus that would compromise distal fixation and seal of device. • Morbidly obese body mass index ≥40kg/m^2 or other clinical conditions that inhibit radiographic visualization of aorta	• One or more patent subrenal arteries with potential retrograde flow after stent grafting. • Dominant patent internal mammary artery, occluded or stenotic celiac and superior mesenteric artery.Lesion that cannot be crossed with guidewire. • No distal vascular bed (one vessel lower extremity run-off required)

*Although the inclusion criteria for proximal AAA neck length was ≥ 5 mm in the Talent clinical study, Medtronic decided to indicate as part of the Talent Stent Graft System marketing application a proximal AAA neck length of ≥ 10 mm.

3.2 Treatment and Follow-Up Schedule:

The Endurant Stent Graft System was used in the endovascular treatment of abdominal aortic or aortoiliac aneurysms. The following follow-up scheme was required for both Endurant and Talent:

1. 1 month following the index procedure;
2. 6 months following the index procedure;
3. 12 months following the index procedure; and
4. annually thereafter, for a total of 5 years from the index procedure.

At each visit, abdominal X-ray and CT with and without contrast medium were required. Alternative imaging modalities such as Color Duplex Ultrasound, Magnetic Resonance Imaging were recommended in patients with impaired renal function or intolerance to contrast media.

B. Patient Accountability, Follow-up, Demographic and Baseline Information

This section contains information on patient accountability and follow-up as well as the demographic and baseline parameters for the Endurant Stent Graft System US Clinical Study.

1.0 Patient Accountability, Follow-up

For the Endurant Test Group, 150 subjects were enrolled across 26 sites. Detailed subject accountability and follow-up are presented in **Table 9**. The numbers found in **Table 9** as well as subsequent sections represent those patients that had data available to assess the relevant parameters. In the Talent Control Group, 166 subjects were enrolled across 13 sites, with 100% (162/162) of available subjects receiving clinical follow-up and 98.8% (160/162) receiving imaging follow-up at one month. At 12 months, 97.2% (138/142) had clinical follow-up and 93.0% (132/142) had imaging follow-up. Additional information on the Talent Control Group patient accountability and follow-up can be found in the Summary of Safety and Effectiveness for P070027.

Table 9: Subject and Imaging Accountability – Endurant Test Group[1]

Interval (Analysis Window)	Subject follow-up			Subjects with imaging performed (Core Lab)		Subjects with adequate imaging to assess the parameter (Core Lab)				Subject events occurring before next visit					
	Eligible	Clinical Follow-up	Imaging Follow-up	CT/MRA Imaging	KUB Imaging	Aneurysm size increase	Endoleak	Migration	Technical Observation [2]	No Implant	Conversion to Surgery	Death	Withdrawal	Lost to Follow-up	Not Due for Next Visit
Originally Enrolled	150									0					
Events after implant but before a 1 Month visit											0	0	0	0	0
1 Month (Day 1-90)	150	149 (99%)	149 (99%)	147 (98%)	124 (83%)		143 (95%)		149 (99%)						
Events after 1 Month visit but before a 6 Month visit											0	2	0	0	0
6 Month (Day 91-304)	148	143 (97%)	138 (93%)	135 (91%)	134 (91%)	132 (89%)	129 (87%)	132 (89%)	138 (93%)						
Events after 6 Month visit but before a 12 Month visit											0	4	0	0	12
12 Month (≥ Day 305[3])	132	128 (97%)	129 (98%)	128 (97%)	125 (95%)	127 (96%)	123 (93%)	125 (95%)	129 (98%)						

[1] Data analysis sample size varies for each of the timepoints above and in the following tables. This variability is due to subject availability for follow-up, as well as, quantity and quality of images available from specific timepoints for evaluation. For example, the number and quality of images available for evaluation of endoleak at 6 months is different than the number and quality of images available at 12 months due to variation in the number of image exams performed, the number of images provided from the clinical site to the Core Lab, and/or the number of images with acceptable evaluation quality.

[2] Technical observations assessed by imaging include stent-graft kinking, stent-graft twisting, stent-graft wireform fracture, suprarenal bare stent fracture, anchor pin fracture, and stent-graft stenosis.

[3] In cases where 12 month imaging follow-up data were not available, subsequent imaging follow-up data were used.

C. Study Population Demographics and Baseline Parameters

The demographics between the Endurant Test Group and Talent Control Group were comparable. The sex/gender distribution was similar between the two study groups and consistent with studies of other devices for the treatment of Abdominal Aortic Aneurysms. The baseline medical histories of the Endurant test group and Talent control group were sufficiently similar to allow comparison of device safety and effectiveness, with high prevalence of hypertension, chronic obstructive pulmonary disease and tobacco use in the past 10 years in both study groups. The significant difference between Endurant and Talent in baseline PVD was not considered sufficient to invalidate the comparison. The baseline SVS/AAVS risk classifications were similar with over 80% subjects with SVS 2 or above in both study groups.

Table 10 through **Table 12** provides the demographics, baseline medical history and SVS risk classification of the Endurant Test Group and the Talent Control Group. **Table 13** and **Table 14** provide baseline aneurysm characteristics and distribution of aneurysm diameters for both the Endurant and Talent groups.

Table 10: Subject Demographics

Parameter	Statistics/Category	Endurant Test Group (N=150)	Talent Control Group (N=166)	p-Value[1]
Age (years)				
	Mean ± SD	73.1 ± 8.0	74.1 ± 7.5	0.255
	Median	73.0	76.0	
	Min, max	52, 88	51, 89	
Sex/Gender % (m/n)				
	Male	91.3% (137/150)	91.6% (152/166)	> 0.999
Race % (m/n)				
	White	98.7% (148/150)	92.8% (154/166)	0.013
	Non-white	1.3% (2/150)	7.2% (12/166)	
[1] p-values were based on t-tests for continuous variables and Fisher's Exact test for categorical variables.				

Table 11: Baseline Medical History

Body System / Condition	Endurant Test Group % (m/n)	Talent Control Group % (m/n)	p-Value[1]
Cardiovascular			
Angina	18.0% (27/150)	16.9% (28/166)	0.882
Arrhythmia	39.3% (59/150)	44.0% (73/166)	0.426
Congestive heart failure	16.0% (24/150)	28.3% (47/166)	0.010
Hypertension	86.7% (130/150)	83.7% (139/166)	0.528
Myocardial infarction	30.0% (45/150)	38.6% (64/166)	0.124
Peripheral vascular disease	22.7% (34/150)	46.4% (77/166)	< 0.001
Renal			
Renal insufficiency	28.7% (43/150)	33.1% (55/166)	0.397
Other abnormal body systems			
Chronic obstructive pulmonary disease	35.3% (53/150)	39.2% (65/166)	0.488
Diabetes	26.7% (40/150)	15.7% (26/166)	0.019
Tobacco use in the last 10 years	44.0% (66/150)	44.6% (74/166)	> 0.999
[1]p-values were based on Fisher's Exact Test			

Table 12: Baseline Modified SVS Classification

SVS/AAVS Classification	Endurant Test Group % (m/n)	Talent Control Group % (m/n)	p-Value[1]
SVS 0	0.0% (0/150)	0.6% (1/166)	0.802
SVS 1	16.0% (24/150)	15.7% (26/166)	
SVS 2	54.7% (82/150)	55.4% (92/166)	
SVS 3	29.3% (44/150)	28.3% (47/166)	
[1] p-value was based on the Cochran-Mantel-Haenzel test for mean score differences in SVS classification			

Table 13 and **Table 14** provide the baseline aneurysm and anatomical measurements of the Endurant Test Group and Talent Control Group.

Table 13: Baseline Aneurysm Characteristics (Corelab Reported)

Dimension	Statistics	Endurant Test Group	Talent Control Group	p-Value[2]
Maximum aneurysm diameter (mm)	n[1]	150	156	
	Mean ± SD	55.9 ± 8.7	55.0 ± 9.3	0.359
	Median	54	53	
	Min, Max	39, 103	38, 88	
Proximal neck diameter (mm)	n[1]	150	156	
	Mean ± SD	23.5 ± 3.0	25.3 ± 3.6	< 0.001
	Median	23	26	
	Min, Max	17, 31	16, 32	
Right iliac diameter (mm)	n[1]	148	148	
	Mean ± SD	14.2 ± 4.2	14.5 ± 3.6	0.447
	Median	14	14	
	Min, Max	9, 48	7, 39	
Left iliac diameter (mm)	n[1]	150	153	
	Mean ± SD	13.9 ± 3.1	14.3 ± 3.8	0.347
	Median	14	14	
	Min, Max	8, 24	8, 38	
Proximal neck length (mm)	n[1]	150	154	
	Mean ± SD	31.0 ± 14.3	22.9 ± 12.5	<0.001

Dimension	Statistics	Endurant Test Group	Talent Control Group	p-Value[2]
	Median	29	21	
	Min, Max	5[3], 74	3, 75	
Infrarenal neck angle (°)	n[1]	150	127	
	Mean ± SD	35.2 ± 13.7	30.5 ± 15.8	0.009
	Median	34	30	
	Min, Max	5, 73	0, 72	
Suprarenal neck angle (°)	n[1]	150	NA	
	Mean ± SD	16.0 ± 10.3	NA	NA
	Median	14	NA	
	Min, Max	2, 58	NA	

[1] Number of subjects with readable scans.
[2] p-Values were based on a two-sample t-test
[3] Based on Core Lab measurements, two (2) subjects had proximal neck length measurements <10 mm and were outside the margin of error; however, the site reported measurements were > 10 mm.

Table 14: Distribution of Aneurysm Diameters (Core lab reported)

	Statistics/ Category	Endurant Test Group	Talent Control Group
Maximum Aneurysm Diameter %(m/n)[1]	< 30 mm	0.0% (0/150)	0.0% (0/156)
	30 mm - < 40 mm	0.7% (1/150)	1.3% (2/156)
	40 mm - < 50 mm	16.0% (24/150)	26.3% (41/156)
	50 mm - < 60 mm	63.3% (95/150)	44.2% (69/156)
	60 mm - < 70 mm	13.3% (20/150)	20.5% (32/156)
	70 mm - < 80 mm	4.0% (6/150)	5.8% (9/156)
	80 mm - < 90 mm	1.3% (2/150)	1.9% (3/156)
	90 mm - < 100 mm	0.7% (1/150)	0.0% (0/156)
	100 mm - < 110 mm	0.7% (1/150)	0.0% (0/156)
	≥ 110 mm	0.0% (0/150)	0.0% (0/156)
Aneurysm Diameter % (m/n) < 50 mm		16.7% (25/150)	27.6% (43/156)
Aneurysm Diameter % (m/n) ≥ 50mm		83.3% (125/150)	72.4% (113/156)

[1] n = number of subjects with readable scans.

2.0 Devices Implanted

Table 15 below provides a breakdown of the number of Endurant Stent Graft devices implanted at the index procedure per subject.

Table 15: Total Number of Devices Implanted at Initial Procedure

Number of Devices Implanted on a Subject	Endurant Test Group (%m/n)[1]
1	0.7% (1/150)
2	40.0% (60/150)
3	30.0% (45/150)
4	25.3% (38/150)
5	3.3% (5/150)
6	0.7% (1/150)
≥ 7	0.0% (0/150)
[1] Denominator includes all subjects who received the test device.	

2.1 Device Implanted by Type at Index Procedure

All 150 Endurant subjects received a main bifurcated device and all but one (1) subject received a contralateral limb device. Forty-five (45) subjects received aortic or iliac limb extension(s). Since multiple stent graft configurations may be used in a single subject, the number of total devices implanted exceeded the number of subjects enrolled. There was limited use of aortic extensions in the US clinical study. However, it is important to note that the design of the proximal section of the aortic extension component (i.e., the suprarenal stent and the seal stent) is identical to the design of the proximal section of the bifurcated component; therefore, the performance of the two components is expected to be comparable.

Table 16: Devices Implants by Type at Index Procedure

Device Type	Endurant Test Group (%m/n)[1]
Main Bifurcated	100.0% (150/150)
Contralateral Limb	99.3% (149/150)
Extension - any type	30.0% (45/150)
Extension – iliac	28.7% (43/150)
Extension – aorta	2.0% (3/150)
[1] Denominator includes all subjects who received the test device. A subject may receive multiple device types.	

2.2 Sizes of Devices Implanted

Table 17 below shows the distribution of sizes of the bifurcated stent graft used in the Endurant US Clinical Study.

Table 17: Devices Implanted by Size at Index Procedure

Stent Graft Proximal Diameter (Main Bifurcated, mm)	Endurant % (m/n)[1]
23	10.7% (16/150)
25	26.0% (39/150)
28	36.7% (55/150)
32	22.0% (33/150)
36	4.7% (7/150)

[1] Denominator includes all subjects who received the main bifurcated test device.

D. Safety and Effectiveness Results

Table 18 presents the key outcomes of the Endurant US IDE Clinical Trial; detailed analyses may be found in the following sections.

Table 18: Summary of Key Outcomes

	Total Number of Patients Reaching Follow-up		Aneurysm Rupture		Conversion to Surgical Repair		Death		Aneurysm Related Mortality[1]		Major Adverse Event	
	T N	C N	T N	C N	T N	C N	T N (%)	C N (%)	T N (%)	C N (%)	T N (%)	C N (%)
Intra-operative	150	166	1	0	0	0	0	0	0	0	n/a[2]	n/a[2]
≤ 30 Days	150	166	0	0	0	0	0 (0%)	3 (2%)	0 (0%)	3 (2%)	6 (4%)	18 (11%)
> 30 Days to 12 Months	150	157	0	0	0	0	6 (4%)	10 (7%)	0 (0%)	3 (2%)	11 (7%)	13 (8%)
Total Patients	150	166	0	0	0	0	6	13	0	3	15[3]	30[3]
Kaplan-Meier Summaries			Freedom from Aneurysm Rupture		Freedom from Conversion		Probability of Survival		Freedom from Aneurysm Related Death		Freedom from Major Adverse Event	
12 Month Kaplan-Meier	150	157	99.3%	100%	100%	100%	95.8%	93.7%	100%	98.2%	89.3%[3]	81.3%[3]

T = Test (Endurant)

C = Control (Talent)

[1] Aneurysm Related Mortality was defined as death from a rupture of the abdominal aortic aneurysm or from any procedure intended to treat the AAA. If a death occurred within 30 days of any procedure intended to treat the AAA, then it was presumed to be aneurysm related.

[2] Major adverse events during the intraoperative period are reported in the ≤30 day period.

[3] Total number of patients with a first adverse event only.

1.0 Clinical Study Results: Safety Endpoints

The primary safety hypothesis test results demonstrated the safety of the Endurant Bifurcated Stent Graft System for the endovascular treatment of abdominal aortic or aortoiliac aneurysms as compared to the Talent Abdominal Stent Graft System. The primary safety hypothesis holds. Key safety outcomes for this study are reported in **Table 19** through **Table 24** and **Figure 8** through **Figure 9**.

1.1 Major Adverse Events (MAEs) within 30 Days (Primary Safety Endpoint)

Table 19 and **Table 20** provide an analysis of the MAEs within 30 days. 96.0% subjects in the Endurant Test Group were MAE-free as compared to 89.2% subjects in the Talent Control Group.

Table 19: MAE Free Rate within 30 Days

MAEs Free Rate within 30 Days	Endurant Test Group (%m/n)	Talent Control Group (%m/n)
MAE-Free Rate within 30 Days	96.0% (144/150)	89.2% (148/166)

Table 20: MAE Components within 30 Days

Major Adverse Event (MAE) within 30 Days[1]	Endurant Test Group (%m/n)	Talent Control Group (%m/n)
MAE at 30 days	4.0% (6/150)	10.8% (18/166)
All-cause Death	0.0% (0/150)	1.8% (3/166)
Myocardial Infarction	0.7% (1/150)	1.8% (3/166)
Renal Failure	0.7% (1/150)	1.8% (3/166)
Respiratory Failure	1.3% (2/150)	3.0% (5/166)
Paraplegia	0.0% (0/150)	0.0% (0/166)
Stroke	0.7% (1/150)	1.2% (2/166)
Bowel Ischemia	1.3% (2/150)	0.6% (1/166)
Procedural Blood Loss $\geq$ 1000cc	0.7% (1/150)	5.4% (9/166)

[1] A subject may report multiple MAEs; hence, number of subjects with any MAE may not be the sum of those in each MAE category.

1.2 Aneurysm-related Mortality (ARM) Free Rate within 12 Months

Table 21: Aneurysm-related Mortality free rate within 12 Months

Aneurysm-Related Mortality Free Rate	Endurant Test Group % (m/n)[1]	Talent Control Group % (m/n)[1]
Aneurysm-Related Mortality Free Rate within 12 Months[2]	100.0% (133/133)	97.9% (143/146)

[1] Denominators included all subjects who had the event within 365 days or those were followed for at least 305 days.
[2] Aneurysm Related Mortality was defined as death from a rupture of the abdominal aortic aneurysm or from any procedure intended to treat the AAA. If a death occurred within 30 days of any procedure intended to treat the AAA, then it was presumed to be aneurysm related.

1.3 Freedom From Aneurysm-related Mortality (ARM) within 12 Months

In addition a Kaplan-Meier analysis of freedom from ARM was performed and is plotted in **Figure 8**. Kaplan-Meier analysis predicts a freedom from ARM rate within 12 months of 100% in the Endurant Test Group as compared to 98.2% in the Talent Control Group. The data used in the Kaplan-Meier analysis is presented in tabular format in **Table 22**.

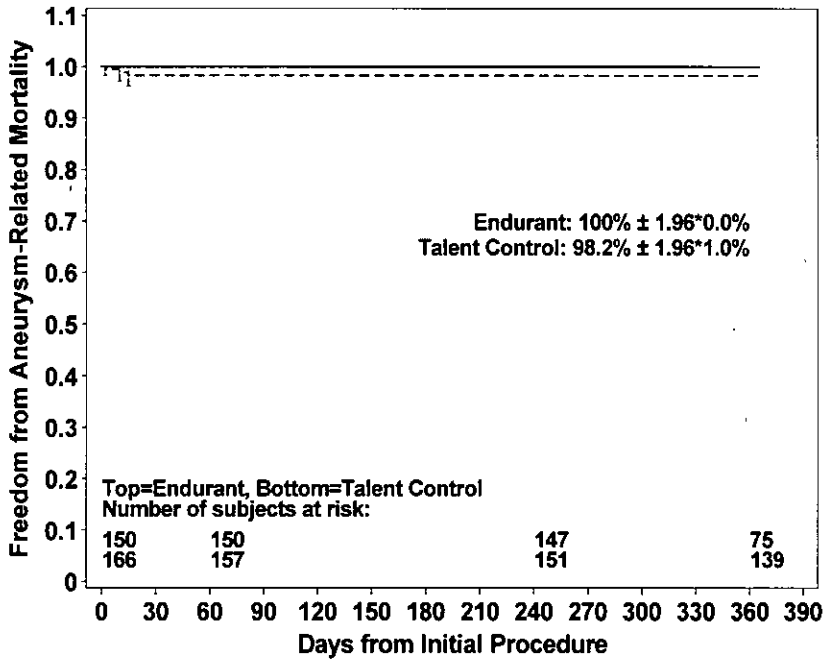


Figure 8: Kaplan-Meier Analysis: Freedom from Aneurysm-Related Mortality within 12 Months

Table 22: Kaplan-Meier Estimates of Freedom from Aneurysm-Related Mortality through 12 months[1]

	Endurant Test Group			Talent Control Group		
	Treatment to 30 days	31 to 182 days	183 to 365 days	Treatment to 30 days	31 to 182 days	183 to 365 days
No. at Risk[2]	150	150	147	166	157	151
No. of Events	0	0	0	3	0	0
No. Censored[3]	0	3	72	6	6	12
Kaplan-Meier Estimate[4]	1.000	1.000	1.000	0.982	0.982	0.982
Standard Error	0.000	0.000	0.000	0.010	0.010	0.010

[1] Aneurysm Related Mortality was defined as death from a rupture of the abdominal aortic aneurysm or from any procedure intended to treat the AAA. If a death occurred within 30 days of any procedure intended to treat the AAA, then it was presumed to be aneurysm related

[2] Number of subjects at risk at the beginning of interval.

[3] Subjects are censored because their last follow-up has not reached the end of the time interval or because they are lost to follow-up.

[4] Estimate made at end of time interval.

1.4 All-cause Mortality Free Rate within 30 Days

Table 23 provides the all-cause mortality free rate within 30 days for the Endurant Test Group and Talent Control Group. The all-cause mortality free rate for the Endurant Test Group was 100.0% whereas it was 98.2% in the Talent Control Group.

Table 23: All-cause Mortality Free Rate within 30 Days

All-Cause Mortality Free Rate	Endurant Test Group (%m/n)	Talent Control Group (%m/n)
All-Cause Mortality Free Rate within 30 Days	100.0% (150/150)	98.2% (163/166)

1.5 All-cause Mortality Free Rate within 12 Months

Table 24 provides the all-cause mortality free rate within 12 months for the Endurant Test Group and Talent Control Group. The all-cause mortality free rate at 12 months was 95.7% for the Endurant Test Group as compared to 93.4% for the Talent Control Group.

Table 24: All-Cause Mortality Free Rate within 12 Months

All-cause Mortality Free Rate	Endurant Test Group (%m/n)	Talent Control Group (%m/n)
All-cause Mortality Free Rate within 12 Months	95.7% (132/138)	93.4% (141/151)
[1]Denominators included all subjects who had the event within 365 days or those were followed for at least 305 days.		

1.6 Freedom From All-cause Mortality within 12 Months

In addition a Kaplan-Meier analysis of freedom from all-cause mortality was performed and is plotted in **Figure 9**. Kaplan-Meier analysis predicts a freedom from all-cause mortality within 12 months of 95.8% in the Endurant Test Group as compared to 93.7% in the Talent Control Group. The data used in the Kaplan-Meier analysis is presented in tabular format in **Table 25**.

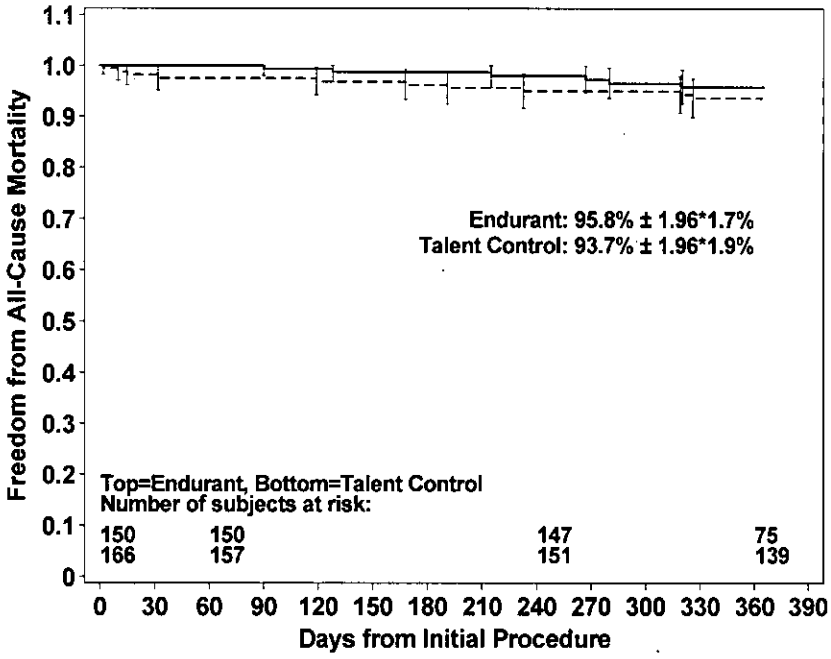


Figure 9: Kaplan-Meier Analysis: Freedom from All-cause Mortality within 12 Months

Table 25: Kaplan-Meier Estimates of Freedom from All-Cause Mortality through 12 Months

	Endurant Test Group			Talent Control Group		
	Treatment to 30 days	31 to 182 days	183 to 365 days	Treatment to 30 days	31 to 182 days	183 to 365 days
No. at Risk[1]	150	150	147	166	157	151
No. of Events	0	2	4	3	3	4
No. Censored[2]	0	1	68	6	3	8
Kaplan-Meier Estimate[3]	1.000	0.987	0.958	0.982	0.963	0.937
Standard Error	0.000	0.009	0.017	0.010	0.015	0.019

[1] Number of subjects at risk at the beginning of interval.
[2] Subjects are censored because their last follow-up has not reached the end of the time interval or because they are lost to follow-up.
[3] Estimate made at end of time interval.

2.0 Site Reported Adverse Events

Site-reported adverse events (AEs) for all enrolled subjects were categorized, and the total number of subjects with one or more AEs in each category and their relative percentages are summarized below for serious adverse events (SAEs), device-related AEs, procedure-related AEs, and all AEs excluding SAEs.

2.1 Serious Adverse Events (Site Reported)

Table 26 describes the Serious Adverse Events as reported by the Endurant Stent Graft System clinical investigational sites. The 30-day SAE rate was 28.7% in the Endurant Test Group and 40.4% in the Talent Control Group. The 12-month SAE rate was 40.7% in the Endurant Test Group and 53.0% in Talent Control Group. "Other events" was 22.7% for the Endurant Test Group and 14.5% for the Talent Control Group at 12 months. The most common "Other events" in the Endurant Test Group were fever and urologic events.

In the Endurant Test Group, the most frequent SAEs within 30 days were "other" events (16.0%) that occurred in 24 subjects.

Table 26: Serious Adverse Events within 12 Months (Site Reported)

	0-30 Days		31-365 Days		0-365 Days	
Serious (site reported) Adverse Event Category Subcategory	**Endurant Test Group % (m/n[1])**	**Talent Control Group % (m/n[1])**	**Endurant Test Group % (m/n[1])**	**Talent Control Group % (m/n[1])**	**Endurant Test Group % (m/n[1])**	**Talent Control Group % (m/n[1])**
Respiratory events	4.0% (6/150)	4.2% (7/166)	8.0% (12/150)	4.5% (7/157)	10.0% (15/150)	8.4% (14/166)
Renal events	2.0% (3/150)	4.2% (7/166)	2.7% (4/150)	2.5% (4/157)	4.7% (7/150)	6.6% (11/166)
Cardiac events	8.7% (13/150)	7.2% (12/166)	5.3% (8/150)	7.6% (12/157)	12.0% (18/150)	14.5% (24/166)
Neurological events	2.7% (4/150)	0.6% (1/166)	2.0% (3/150)	3.2% (5/157)	4.0% (6/150)	3.6% (6/166)
Gastrointestinal events	3.3% (5/150)	1.8% (3/166)	2.0% (3/150)	3.8% (6/157)	5.3% (8/150)	5.4% (9/166)
Bleeding events[5]	3.3% (5/150)	31.9% (53/166)	2.7% (4/150)	2.5% (4/157)	6.0% (9/150)	31.9% (53/166)
Vascular events	4.0% (6/150)	3.6% (6/166)	2.0% (3/150)	3.2% (5/157)	6.0% (9/150)	6.6% (11/166)
Other events	16.0% (24/150)	5.4% (9/166)	6.7% (10/150)	11.5% (18/157)	22.7% (34/150)	14.5% (24/166)

	0-30 Days		31-365 Days		0-365 Days	
Serious (site reported) Adverse Event Category Subcategory	**Endurant Test Group % (m/n[1])**	**Talent Control Group % (m/n[1])**	**Endurant Test Group % (m/n[1])**	**Talent Control Group % (m/n[1])**	**Endurant Test Group % (m/n[1])**	**Talent Control Group % (m/n[1])**
Subjects experiencing one or more serious AEs[2]	28.7% (43/150)	40.4% (67/166)	24.7% (37/150)	25.5% (40/157)	40.7% (61/150)	53.0% (88/166)

[1] Number of subjects at risk at the beginning of the time interval.
[2] A subject may report multiple adverse events and in different categories; hence, number of subjects in each category may not be the sum of those in each subcategory. Each subject was only counted once in each category.
[3] Lung cancer in the Talent Control Group was reported under Other Events.
[4] Numbness, constipation and fever were not recorded as a separate category in the Talent Control Group and thus not available for comparison.
[5] Blood loss was captured differently in Endurant than in Talent. Procedural blood loss > 500 cc was considered a bleeding event in the Talent Control Group; Endurant included only Procedural Blood Loss >1000cc in this category.

2.2 Device-Related Adverse Events (Site Reported)

Table 27 describes the Device-Related Adverse Events as reported by the Endurant Stent Graft System clinical investigational sites. The overall percentage of subjects who experienced one or more device-related AEs through 12 months of the index procedure in the Endurant Test Group was 1.3% as compared to 4.2% in the Talent Control Group.

Table 27: Device-Related Adverse Events through 12 Months (Site Reported)

	0-30 Days		31-365 Days		0-365 Days	
Device-related (site reported) Adverse Event Category Subcategory	**Endurant Test Group % (m/n[1])**	**Talent Control Group % (m/n[1])**	**Endurant Test Group % (m/n[1])**	**Talent Control Group % (m/n[1])**	**Endurant Test Group % (m/n[1])**	**Talent Control Group % (m/n[1])**
Renal events	0.0% (0/150)	1.2% (2/166)	0.0% (0/150)	0.0% (0/157)	0.0% (0/150)	1.2% (2/166)
Vascular events[3]	0.7% (1/150)	2.4% (4/166)	0.7% (1/150)	0.6% (1/157)	1.3% (2/150)	3.0% (5/166)
Subjects experiencing one or more device-related AEs[2]	0.7% (1/150)	3.6% (6/166)	0.7% (1/150)	0.6% (1/157)	1.3% (2/150)	4.2% (7/166)

[1] Number of subjects at risk at the beginning of the time interval.
[2] A subject may report multiple adverse events and in different categories; hence, number of subjects in each category may not be the sum of those in each subcategory. Each subject was only counted once in each category.
[3] Stent graft occlusions and certain endoleaks that required intervention in both the Endurant and Talent study groups were device-related adverse events but were not listed in this table. The difference in device-related adverse event definition and how the data was collected between the two studies prevented a meaningful comparison of these events in this table. Please refer to Section 9.3 for further information of the Endurant events.

2.3 Procedure-Related Adverse Events (Site Reported)

Table 28 describes the Procedure-Related Adverse Events as reported by the Endurant Stent Graft System clinical investigational sites. The overall percentage of subjects who experienced one or more procedure-related AE within 30 days of index procedure in the Endurant Test Group was 52.7%, which was similar to the 57.8% seen in the Talent Control Group. When comparing the event rates, it is important to note that the change in site-reporting standard and clinical practice over time may have explained the difference between the two study groups.

Table 28: Procedure-Related Adverse Events through 12 Months (Site-Reported)

	0-30 Days		31-365 Days		0-365 Days	
Procedure-related (site reported) Adverse Event Category Subcategory	**Endurant Test Group % (m/n[1])**	**Talent Control Group % (m/n[1])**	**Endurant Test Group % (m/n[1])**	**Talent Control Group % (m/n[1])**	**Endurant Test Group % (m/n[1])**	**Talent Control Group % (m/n[1])**
Respiratory events	2.7% (4/150)	3.0% (5/166)	0.0% (0/150)	0.6% (1/157)	2.7% (4/150)	3.6% (6/166)
Renal events	2.0% (3/150)	3.6% (6/166)	0.7% (1/150)	0.6% (1/157)	2.7% (4/150)	4.2% (7/166)
Cardiac events	11.3% (17/150)	3.0% (5/166)	0.0% (0/150)	0.6% (1/157)	11.3% (17/150)	3.6% (6/166)
Neurological events	8.7% (13/150)	0.0% (0/166)	0.0% (0/150)	0.6% (1/157)	8.7% (13/150)	0.6% (1/166)
Gastrointestinal events	7.3% (11/150)	2.4% (4/166)	1.3% (2/150)	0.0% (0/157)	8.7% (13/150)	2.4% (4/166)
Bleeding events[4]	12.7% (19/150)	39.2% (65/166)	5.3% (8/150)	5.1% (8/157)	18.0% (27/150)	41.0% (68/166)
Vascular events	4.7% (7/150)	9.6% (16/166)	0.7% (1/150)	2.5% (4/157)	5.3% (8/150)	11.4% (19/166)
Other events[5]	37.3% (56/150)	24.7% (41/166)	0.0% (0/150)	5.1% (8/157)	37.3% (56/150)	27.1% (45/166)
Subjects experiencing one or more procedure-related AEs[2]	52.7% (79/150)	57.8% (96/166)	8.0% (12/150)	10.8% (17/157)	58.0% (87/150)	61.4% (102/166)

[1] Number of subjects at risk at the beginning of the time interval.
[2] A subject may report multiple adverse events and in different categories; hence, number of subjects in each category may not be the sum of those in each subcategory. Each subject was only counted once in each category.
[3] Numbness, abdominal pain, constipation and fever were not recorded as a separate category in the Talent Control Group and thus not available for comparison.
[4] Blood loss was captured differently in Endurant than in Talent and therefore not available for comparison.
[5] The most common "Other events" in the Endurant Test Group were Fever, Urologic and Wound Complications.

2.4 Adverse Events (Excluding Serious Adverse Events (SAEs) -Site Reported)

Table 29 describes the Adverse Events (excluding SAEs) reported by the Endurant Stent Graft System clinical investigational sites. The overall percentage of subjects who experienced one or more AEs through 12 months was 80.0% in the Endurant Test Group and 85.5% in the Talent Control Group. The most frequent AEs through 12 months for both Endurant (60.0%) and Talent (60.8%) were categorized as "Other" and included fever, urologic events, and wound complications; these AEs were not deemed to be device related. When comparing the event rates, it is important to note that the change in site-reporting standards and clinical practice over time may have explained the difference between the two study groups.

Table 29: Adverse Events Excluding SAEs through 12 Months (Site Reported)

	0-30 Days		31-365 Days		0-365 Days	
Adverse Event Category Subcategory	**Endurant Test Group % (m/n[1])**	**Talent Control Group % (m/n[1])**	**Endurant Test Group % (m/n[1])**	**Talent Control Group % (m/n[1])**	**Endurant Test Group % (m/n[1])**	**Talent Control Group % (m/n[1])**
Respiratory events	6.7% (10/150)	13.3% (22/166)	4.7% (7/150)	7.0% (11/157)	11.3% (17/150)	18.1% (30/166)
Renal events	2.0% (3/150)	7.8% (13/166)	3.3% (5/150)	8.9% (14/157)	5.3% (8/150)	15.1% (25/166)
Cardiac events	16.7% (25/150)	16.9% (28/166)	2.7% (4/150)	9.6% (15/157)	18.0% (27/150)	23.5% (39/166)
Neurological events	10.0% (15/150)	6.0% (10/166)	3.3% (5/150)	4.5% (7/157)	12.7% (19/150)	9.0% (15/166)
Gastrointestinal events	18.0% (27/150)	15.1% (25/166)	11.3% (17/150)	6.4% (10/157)	28.7% (43/150)	20.5% (34/166)
Bleeding events[4]	13.3% (20/150)	30.1% (50/166)	8.7% (13/150)	8.3% (13/157)	21.3% (32/150)	34.9% (58/166)
Vascular events	1.3% (2/150)	13.9% (23/166)	4.0% (6/150)	6.4% (10/157)	5.3% (8/150)	18.7% (31/166)
Other events[5]	46.0% (69/150)	52.4% (87/166)	26.7% (40/150)	21.7% (34/157)	60.0% (90/150)	60.8% (101/166)
Subjects experiencing one or more non-serious AEs[2]	60.0% (90/150)	75.9% (126/166)	46.7% (70/150)	42.0% (66/157)	80.0% (120/150)	85.5% (142/166)

[1] Number of subjects at risk at the beginning of the time interval.
[2] A subject may report multiple adverse events and in different categories; hence, number of subjects in each category may not be the sum of those in each subcategory. Each subject was only counted once in each category.
[3] Numbness, abdominal pain, constipation and fever were not recorded as a separate category in the Talent Control Group and thus not available for comparison.
[4] Blood loss was captured differently in Endurant than in Talent and therefore not available for comparison.
[5] The most common "Other events" in the Endurant Test Group were Fever, Urologic and Wound Complications.

3.0 Clinical Study Results: Effectiveness Endpoints

The primary effectiveness study hypothesis was met, demonstrating successful aneurysm treatment at 12 months post implantation of the Endurant Stent Graft as compared to the Talent Abdominal Stent Graft. Data on 129 evaluable subjects were available at 12-months post index procedure. Key effectiveness outcomes are reported in **Table 30** through **Table 37**.

3.1 Technical Success

During the index procedure, 99.3% subjects in the Endurant Test Group were recorded as having successful delivery and deployment of the Endurant Bifurcated Stent Graft compared to 97.6% in the Talent Control Group. One (1) subject had the main bifurcated body implanted but the physician was not able to cannulate the contralateral gate due to a pre-existing challenging anatomy. The subject was ultimately converted to aorto-uni-iliac *in-situ*, and a femoral-to-femoral bypass was performed.

Each of the four Technical Failures in the Talent Control Group was associated with access issues due to diseased or calcified vessels or other access issues, (i.e., a lacerated femoral artery).

Table 30: Technical Success

	Endurant Test Group	Talent Control Group
Technical Success[1]	99.3% (149/150)	97.6% (162/166)
[1] Defined as the successful delivery and deployment of the stent graft.		

3.2 Successful Aneurysm Treatment

The overall successful aneurysm treatment rate through 12 months in the Endurant Test was 97.5% as compared to 87.1% in the Talent Control Group. These data are presented in **Table 31.**

Successful aneurysm treatment was an endpoint that included delivery and deployment of the graft and surrogate markers that represented treatment success. These included Aneurysm Growth, Endoleaks, Occlusion, Conversion to Surgery, Rupture and Migration. The information on these endpoints is presented in the sections below.

There were three subjects in the Endurant Test Group that were considered treatment failures. In addition to the technical failure noted above, one subject experienced an aneurysm rupture at the index procedure, and the other had a stent graft occlusion necessitating a femoral-to-femoral bypass.

In addition to the four technical failures noted above for the Talent Control Group, endoleaks (Type I and III), occlusion, and aneurysm diameter increase were also observed.

Table 31: Successful Aneurysm Treatment

	Endurant Test Group % (m/n)[1]	Talent Control Group % (m/n)[1]
Successful Aneurysm Treatment	97.5% (118/121)	87.1% (108/124)

3.3 Change in Aneurysm Diameter

Table 32 showed the change in aneurysm diameter as identified by Core Lab from 1 month to 12 months. In the Endurant Test Group, there were no aneurysm diameter increases >5 mm whereas the Talent Control Group reported that 2.3% of subjects has an aneurysm growth > 5mm. About 50% of the Endurant subjects had a decrease of aneurysm size greater than 5 mm.

Table 32: Aneurysm Diameter Change from 1 Month to 12 Months (Core Lab)

Change in Maximum Aneurysm Diameter from 1 Month to 12 Months[1]	Endurant Test Group % (m/n)[2]	Talent Control Group % (m/n)[2]
Increase more than 5 mm	0.0% (0/127)	2.3% (3/128)
Stable[3]	50.4% (64/127)	64.8% (83/128)
Decrease more than 5 mm	49.6% (63/127)	32.8% (42/128)

[1] Change in aneurysm diameter is based on 1-month imaging. When 1-month imaging was not available, the pre-discharge imaging was used as the baseline.
[2] Denominator is number of subjects evaluable for this endpoint.
[3] Stable refers to no change (increase or decrease) of more than 5 mm.

3.4 Endoleak by Visit

Table 33 shows all types of endoleak as identified by Core Lab at 1 month, 6 months and 12 months for Endurant and Talent. There were no Type I and/or III endoleaks at 1 month, 6 months and 12 months in the Endurant group.

Table 33: All Endoleaks at 1-Month, 6-Months and 12-Months (Core Lab)

	1 Month		6 Months		12 Months	
Endoleaks	**Endurant Test Group % (m/n[1])**	**Talent Control Group % (m/n[1])**	**Endurant Test Group % (m/n[1])**	**Talent Control Group % (m/n[1])**	**Endurant Test Group % (m/n[1])**	**Talent Control Group % (m/n[1])**
Type I	0.0% (0/143)	9.3% (14/151)	0.0% (0/129)	4.2% (5/118)	0.0% (0/123)	2.5% (3/122)
Type II	16.1% (23/143)	8.6% (13/151)	11.6% (15/129)	8.5% (10/118)	8.9% (11/123)	6.6% (8/122)
Type III	0.0% (0/143)	0.0% (0/151)	0.0% (0/129)	0.0% (0/118)	0.0% (0/123)	0.0% (0/122)
Type IV	0.0% (0/143)	0.0% (0/151)	0.0% (0/129)	0.0% (0/118)	0.0% (0/123)	0.0% (0/122)
Indeterminate	0.0% (0/143)	1.3% (2/151)	0.0% (0/129)	1.7% (2/118)	0.8% (1/123)	0.8% (1/122)
Subjects had endoleaks of any type[2]	16.1% (23/143)	19.2% (29/151)	11.6% (15/129)	14.4% (17/118)	9.8% (12/123)	9.8% (12/122)

[1] Denominator is the number of subjects who had readable images at the time of assessment.
[2] A subject may have more than one type of endoleaks; hence, number of subjects with any type may not be the sum of those in each type.

3.5 Stent Graft Migration (Core lab)

There was no stent graft migration in the Endurant Test Group through 12 months as shown in **Table 34**. There was one case of stent graft migration reported in the Talent Control group.

Table 34: Stent Graft Migration through 12 Months

	Endurant Test Group % (m/n)[2]	**Talent Control Group % (m/n)[2]**
Stent graft migration through 12 months[1]	0.0% (0/125)	0.8% (1/128)

[1] Migration is defined as evidence of movement of the stent graft relative to fixed anatomic landmarks, which is not due to remodeling of the subject's vasculature. Migration is observed when the stent graft covers a renal artery or movement is >10 mm

3.6 Aneurysm Rupture and Conversion to Surgery

In the Endurant Test Group, one (1) subject experienced an intra-operative aneurysm rupture through 12 months. The rupture occurred during the balloon dilatation (done to ensure good aortic wall apposition) and after the implantation of the stent graft during the procedure. The subject was successfully treated endovascularly with an aortic cuff. As of the 12-month period, the subject was alive per site contact. There were no aneurysm ruptures reported in the Talent Control Group.

There were no conversions to open surgery through 12 months in the Endurant Test Group or the Talent Control Group.

These results are provided in **Table 35**.

Table 35: Aneurysm Rupture and Conversion to Surgery through 12 Months

	Endurant Test Group % (m/n)[1]	Talent Control Group % (m/n)[1]
Aneurysm Rupture	0.8% (1/133)	0.0% (0/143)
Conversion to Surgery	0.0% (0/133)	0.0% (0/143)

[1] Denominator is number of subjects evaluable for this endpoint. A subject is evaluable if it had an event within 365 days post-implant or was followed for at least 305 days.

3.7 Stent Graft Patency

Through 12 months, there were four (4) subjects who experienced stent graft occlusion in the Endurant Test Group and three (3) subjects in the Talent Control Group, resulting in the stent graft patency rate of 96.8% and 97.5%, respectively. All four (4) subjects in the Endurant Test Group underwent secondary procedures and were treated successfully with blood flow restored to the lower extremity. Multiple factors contributed to the occlusion of the stent grafts including significant calcification in the common iliac artery, significant oversizing of the limb in a tortuous portion of the iliac artery, compression of the stent graft limb by pre-existing thrombus at the aortic bifurcation, and sharp iliac angulation with pre-existing stenosis.

Additionally, one subject experienced graft limb stenosis and was treated successfully with angioplasty and stenting. This patient did not experience stent graft occlusion.

3.8 Secondary Procedures

Through 12 months, seven (7) subjects required secondary intervention in the Endurant Test Group. Four (4) subjects experienced limb occlusions and were treated successfully. Two (2) subjects were treated for Type II endoleaks; neither subject experienced an increase in aneurysm diameter. One (1) subject experienced limb graft stenosis and was treated successfully with angioplasty and stenting. This resulted in an overall secondary procedure rate of 5.1%.

Sixteen subjects in the Talent Control Group had secondary procedures through 12 months, resulting in an overall secondary procedure rate of 11.1%.

No subjects required secondary procedures to treat Type I and/or III endoleak through 12 months in the Endurant Test Group as shown in **Table 36**.

Table 36: Secondary Procedures through 12 Months

	Endurant Test Group % (m/n)[1]	**Talent Control Group % (m/n)[1]**
Secondary procedures through 12 months	5.1% (7/136)	11.1% (16/144)
[1] Denominator is number of subjects evaluable for this endpoint. A subject is evaluable if it had an event within 365 days post-implant or was followed for at least 305 days.		

3.9 Technical Observations

Technical observation is defined as an observed defect or malfunction of the stent graft which is not related to any adverse events. Based on Core Lab assessment, the technical observation rate at 12 months in both the Endurant Test Group and Talent Control Group was 2.3% as shown in **Table 37**.

Table 37: Technical Observations through 12 Months (Core Lab)

	1 Month		6 Months		12 Months	
Technical Observations[1]	**Endurant Test Group % (m/n)**	**Talent Control Group % (m/n)**	**Endurant Test Group % (m/n)**	**Talent Control Group % (m/n)**	**Endurant Test Group % (m/n)**	**Talent Control Group % (m/n)**
Anchor pin fracture[2]	0.0% (0/149)	NA	0.0% (0/138)	NA	0.0% (0/129)	NA
Stent graft kinking/twisting	0.7% (1/149)	4.4% (7/158)	1.4% (2/138)	0.8% (1/129)	0.8% (1/129)	1.5% (2/132)
Stent graft kinking[3]	0.7% (1/149)	NA	1.4% (2/138)	NA	0.8% (1/129)	NA
Stent graft twisting[3]	0.0% (0/149)	NA	0.0% (0/138)	NA	0.0% (0/129)	NA
Stent graft stenosis	0.7% (1/149)	0.6% (1/158)	0.0% (0/138)	0.0% (0/129)	1.6% (2/129)	0.0% (0/132)
Stent graft wireform fracture	0.0% (0/149)	0.0% (0/158)	0.0% (0/138)	1.6% (2/129)	0.0% (0/129)	0.8% (1/132)
Suprarenal bare stent fracture[4]	0.0% (0/149)	NA	0.0% (0/138)	NA	0.0% (0/129)	NA
Any Technical Observations[5]	1.3% (2/149)	4.4% (7/158)	1.4% (2/138)	2.3% (3/129)	2.3% (3/129)	2.3% (3/132)

[1] All other Technical Observations as listed in the Investigational Plan were captured under the "Other" category in the eCRFs. None of these other Technical Observations were reported through 12 months.
NA = not available for following reasons:
[2] Anchor pin fracture: Talent does not have anchor pins and is therefore not available for comparison.
[3] Stent graft kinking/twisting: Talent clinical study did not record kinking and twisting separately and is therefore not available for comparison
[4] Suprarenal bare stent fracture: Talent clinical study did not record this category separately and is therefore not available for comparison.
[5] A subject may have technical observations in more than one category; hence, number of subjects with any technical observations may not be the sum of those in each category. Each subject was only counted once in each category.

4.0 Subgroup Analysis

By Sex / Gender Analysis

Medtronic evaluated possible sex/gender based differences in outcome of treatment with the Endurant Stent Graft. **Table 38** shows the results of this subset analysis. Abdominal Aortic Aneurysm disease is predominately found in males; the patient demographics distribution is consistent with studies of other devices for the treatment of abdominal aortic aneurysms..

Table 38: By-Sex / Gender Analysis

	Endurant		Talent Control	
Study Endpoint	**Female % (m/n)**	**Male % (m/n)**	**Female % (m/n)**	**Male % (m/n)**
Primary Safety Endpoint: Freedom from MAEs within 30 Days	100.0% (13/13)	95.6% (131/137)	78.6% (11/14)	90.1% (137/152)
Primary Effectiveness Endpoint: Successful Aneurysm Treatment	91.7% (11/12)	98.2% (107/109)	70.0% (7/10)	88.6% (101/114)

5.0 Acute Procedural Data

Table 39 compares the clinical utility measures of the Endurant Test Group to the Talent Control Group. Acute procedural outcomes for the Endurant Test Group and the Talent Control Group with respect to procedure duration, blood loss, blood transfusion, time in the intensive care unit (ICU) and length of stay in the hospital are presented below.

Table 39: Acute Procedural Data

Acute Procedural Data	Statistics	Endurant Test Group	Talent Control Group
Duration of procedure (min)	N	150	166
	Mean ± SD	101.5 ± 46.2	167.3 ± 53.2
	Median	91.0	155.0
	Min, Max	34, 318	85, 417
Subjects receiving general anesthesia	% (m/n)	83.3% (125/150)	40.4% (67/166)
Estimated blood loss (cc)	N	149	165
	Mean ± SD	184.9 ± 167.9	335 ± 282.4
	Median	150.0	250.0
	Min, Max	0, 1450	25, 1750
Subjects requiring blood transfusion	% (m/n)	0.7% (1/150)	18.2% (30/165)
Time in ICU (hours)	N	150	166
	Mean ± SD	6.2 ± 19.4	19.3 ± 73.9
	Median	0.0	0.0
	Min, Max	0, 135	0, 864
Overall hospital stay (days)	N	150	166
	Mean ± SD	2.1 ± 2.3	3.6 ± 6.4
	Median	1.0	2.0
	Min, Max	1, 17	1, 79

XI. Overall Conclusions Drawn from Preclinical and Clinical Studies

Comprehensive preclinical bench testing was performed on the Endurant Stent Graft System (both the stent graft and the delivery system) in accordance with national and international standards and guidance documents. The testing demonstrated that the Endurant Stent Graft System met its performance and design specifications.

Preclinical *in vivo* animal testing was conducted on 27 animals, using prototypes of the final design, in order to evaluate the acute and chronic performance of the Endurant Stent Graft System. The studies were performed to evaluate deployment, stent graft integrity, and histopathological response in ovine models for up to six months. The results support the safety and expected performance of the Endurant Stent Graft System.

Biocompatibility testing was performed on the Endurant Stent Graft and the Endurant Delivery System in accordance with applicable standards. All testing met the requirements as specified in the applicable standard, ensuring the finished device is biocompatible.

Sterilization, packaging, and shelf life testing were performed on the Endurant Stent Graft System. The testing demonstrated that the Endurant Stent Graft System maintains a Sterility Assurance Level of 10^{-6}. The results of shelf life testing confirmed that the Endurant Stent Graft System maintains functionality throughout its 2-year shelf life, and the packaging testing demonstrated that the packaging adequately protects the device throughout its 2-year shelf life.

The primary safety data from the Endurant IDE study showed that, through 30 days, patients who received the Endurant Stent Graft experienced a low rate of MAEs.

Effectiveness of aneurysm treatment using the Endurant Stent Graft was 97.5% at one year. The subjects treated with the Endurant Stent Graft were 100% migration-free. There was no aneurysm growth at 1 year and a significant number of subjects showed a decrease in aneurysm size. There were no Type I/III Endoleaks. There was one peri-operative aneurysm rupture. As of the 12-month period, the subject was alive per site contact but refused to return for their 12-month follow-up visit. There were no conversions to surgery through 12 months.

The Endurant Stent Graft System met the pre-specified primary safety and effectiveness endpoints and criteria for study success. The data presented formed the basis for FDA's finding that the System is safe and effective for its intended use.

XII. Panel Recommendation

In accordance with provisions of section 515(c)(2) of the act as amended by the Safe Medical Devices Act of 1990, this PMA was not referred to the Circulatory System Devices Panel, an FDA advisory committee, for review and recommendation because the information in the PMA substantially duplicates information previously reviewed by this panel.

XIII. CDRH Decision

FDA issued an approval order on December 16, 2010. The final conditions of approval cited in the approval order are described below.

1. You will provide a clinical update to physician users at least annually. At a minimum, this update will include, for your pivotal study cohort and your post-approval study cohort, a summary of the number of patients for whom data are available, with the rates of aneurysm rupture, secondary endovascular procedures, conversion to surgical repair, aneurysm-related mortality, major adverse events, endoleak, aneurysm enlargement, prosthesis migration, and patency. Reports of losses of device integrity, reasons for conversion and causes of aneurysm-related death and rupture are to be described. A summary of any explant analysis findings are to be included. Additional relevant information from commercial experience within and outside of the US is also to be included. The clinical updates for physician users and the information supporting the updates must be provided in the ODE annual report.

2. In addition to the Annual Report requirements outlined above, you will provide the following data in a separate post-approval study report. You will perform a post-approval study to evaluate the longer-term safety and effectiveness of the Endurant Stent Graft System through five years of implantation. The primary endpoint for this study is freedom from aneurysm-related mortality at 5 years. Aneurysm-related mortality is defined as:

   > Death from rupture of the abdominal aortic aneurysm or from any procedure intended to treat the AAA. If a death occurred within 30 days of any procedure intended to treat the AAA, then it is presumed to be aneurysm related.

   This study is expected to include 220 evaluable patients at the fifth year; 150 endovascular patients from the original pivotal study cohort, as well as enrollment of up to an additional 178 patients. At 1 month, 12 months, and, at each annual visit, an abdominal x-ray, CT scan with and without contrast, and physical examination will be conducted. All data will be entered into a database, analyzed, and submitted in post-approval reports to the FDA, and a final report will be submitted after completion of the follow-up and analysis. This follow-up plan will allow an evaluation of aneurysm-related mortality, major adverse events, migration, patency, endoleaks, device integrity, aneurysm enlargement, aneurysm rupture, secondary endovascular procedures and conversion to open surgical repair over time.

   Upon completion of this post-approval study, you must provide a supplement with revised labeling that reflects the study findings.

3. You will also perform an evaluation to better understand the overall outcomes in females and non-Caucasians undergoing endovascular aneurysm repair (EVAR) with the Endurant Stent Graft System. This evaluation will include a subset evaluation of the females and non-Caucasians enrolled in the post-approval study described in item 2 above, as well as a summary of the current literature research results of females and non-Caucasians having undergone EVAR. This evaluation is to include descriptive statistics

to summarize literature-derived outcomes in patients with the EVAR therapy, literature-derived Endurant Stent Graft-specific outcomes, and post-approval study outcomes in female and non-Caucasians populations. Findings of this evaluation must be provided with each regular post-approval study report update until the completion of the post-approval study described in item 2 above.

The applicant's manufacturing facility was inspected and was found to be in compliance with the Quality System Regulation (21 CFR 820).

XIV. Approval Specifications

Instructions for Use: See labeling.

Hazards to Health from Use of the Device: See Indications, Contraindications, Warnings, Precautions, and Adverse Events in the labeling.

Post-Approval Requirements and Restrictions: See approval order.