IFU, GALILEO™ Centering Catheter, U.S., Commercial, 27 mm

This revision is for filing, registration or translation purposes only.

This version may not be purchased.

GALILEO™ Centering Catheter

NOTE: These instructions pertain to the following catheter balloon sizes and length*:

Diameters	Length*
2.5, 3.0, 3.5 mm	27 mm

**length* is defined as the distance between radiopaque balloon markers and does not include balloon tapers that extend beyond these markers.

1.0 INTRODUCTION

This Instructions for Use (IFU) document, in conjunction with the IFU document for the Source Delivery Unit (SDU), is intended to guide clinicians who have completed the authorized formal training program for the GALILEO™ Intravascular Radiotherapy System. This IFU contains information regarding the Centering Catheter, one component of the GALILEO™ Intravascular Radiotherapy System.

CAUTION. Federal (USA) law restricts this device to sale by or on the order of a physician.

For use with the GALILEO™ Source Delivery Unit and Source Wire (27 mm).

CAREFULLY READ ALL INSTRUCTIONS PRIOR TO USE. FAILURE TO OBSERVE ALL WARNINGS AND PRECAUTIONS MAY RESULT IN COMPLICATIONS.

2.0 SYSTEM DESCRIPTION

The GALILEO™ Centering Catheter is intended for use in intravascular radiotherapy in conjunction with the GALILEO™ Source Delivery Unit and Source Wire, collectively referred to as the GALILEO™ Intravascular Radiotherapy System. A detailed description of the Centering Catheter can be found in Section 4.1. For a detailed description of the SDU, refer to the *GALILEO™ Source Delivery Unit Instructions for Use.*

During a procedure, the Centering Catheter is positioned at the cardiovascular treatment site immediately after an interventional procedure. The Source Wire is automatically advanced from the SDU to the site. A localized, automatically calculated dose of radiation is then delivered to the diseased area for a pre-determined period. The Source Wire is automatically withdrawn back into the SDU, and the procedure is complete.

3.0 ESSENTIAL PRESCRIBING INFORMATION

3.1 INDICATIONS

The GALILEO™ Intravascular Radiotherapy System is intended to deliver beta radiation to the site of successful Percutaneous Coronary Intervention (PCI) for the treatment of in-stent restenosis in native coronary arteries with discrete lesions ≤ 47 mm in a reference vessel diameter 2.4 mm to 3.7 mm.

3.2 CONTRAINDICATIONS

- Unprotected left main disease (> 50% narrowing).
- Patients in whom antiplatelet and/or anticoagulant therapy are contraindicated.

3.3 WARNINGS

Physicians should pay special attention to these warnings about the GALILEO™ Intravascular Radiotherapy System:

- **Every attempt should be made to avoid restenting of the target lesion to minimize the risk of thrombosis.**
- The GALILEO™ Intravascular Radiotherapy System, including the Centering Catheter, should be used by physicians trained in the practice of intravascular radiotherapy. A thorough understanding of the technical principles, clinical applications and risks associated with intravascular radiotherapy is necessary before performing the procedure.
- Misuse or malfunction of the GALILEO™ System can expose the patient, operator and others in the procedure room to unintended radiation exposure.

- Coronary intravascular radiotherapy should be performed only at hospitals where emergency coronary artery bypass surgery can be performed quickly in the event of a potentially injurious or life-threatening complication.

- To minimize the risk of thrombosis when new stents are implanted in conjunction with radiation therapy, a minimum of six (6) months antiplatelet therapy is recommended. If a new stent is not implanted in conjunction with the radiation therapy, antiplatelet therapy should be administered at the physicians discretion. Refer to Section 3.8.

- Treatment should be interrupted and any extended wire must be retracted into the SDU if a patient requires defibrillation or cardioversion while either the InActive or Active wire is extended. The GALILEO™ System is not certified as defibrillation-proof.

- Coronary intravascular radiotherapy using the GALILEO™ System should be carried out only after achieving sufficiently successful intervention of stenotic atherosclerotic lesions in the native coronary arteries.

- Always perform Patient, Centering Catheter, and SDU radiation surveys before and after every treatment. There is no guarantee that the SDU will detect a condition of the source not being in the storage safe under all fault conditions.

- Guide wire prolapse can occur as the Centering Catheter is withdrawn. Do not advance or retract the Centering Catheter over the floppy portion of the guide wire. Do not advance or retract the Centering Catheter unless the balloon is fully deflated and under vacuum. If resistance is met during manipulation, determine the cause of the resistance before proceeding.

- The Centering Catheter is intended for single-procedure use only. **Do not** resterilize and/or reuse it, as this can compromise device performance and increase the risk of cross-contamination due to inappropriate reprocessing.

- This centering catheter should not be used for percutaneous transluminal coronary angioplasty (PTCA) and should not be used for vessel dilatation. The centering catheter is used solely for the centering of the radiation source.

- The balloon pressure of the Centering Catheter should not exceed the operating pressure of 4 atm. The operating pressure is based on results of *in vitro* testing. At least 90% of the balloons (with a 95% confidence) will hold pressure when inflated to the operating pressure (4 atm) for 15 minutes. Use of a pressure-monitoring device is recommended to prevent over-pressurization.

- Use the Centering Catheter prior to the "Use By" date specified on the package.

3.4 PRECAUTIONS

The following precautions are important for the GALILEO™ Intravascular Radiotherapy System:

- **Only Guidant-manufactured Cartridges, Source Wires, and Catheters should be used with the GALILEO™ Source Delivery Unit.**
- The GALILEO™ Centering Catheter is designed to be used by a team of appropriately trained personnel. At a minimum, this team should include an interventional cardiologist, radiation oncologist and medical physicist.
- Prior to each use, ensure that all daily quality assurance checks have been performed.
- Before inserting the GALILEO™ Centering Catheter in the SDU, check the catheter shaft to ensure that there are no kinks or severe bends in order to avoid obstruction errors during treatment.
- In general, balloon diameter should be no more than 0.25 mm larger or smaller than the minimum lumen diameter (MLD) of the lumen in the area to be treated.
- The total artery length that has undergone interventional treatment and injury (including post-stent dilatation) must not exceed 47 mm. Total injured arterial lengths exceeding 22 mm must be treated with tandem balloon positioning.
- During tandem balloon positioning procedures (that is, repositioning the balloon), ideal balloon positioning is achieved when there is no gap or overlap between the distal and proximal segments. At no time should an overlap exceeding 2 mm or a gap exceeding 1 mm be allowed. An overlap will increase the dose delivered to the overlap region, while a gap will decrease the dose delivered to the treated area.
- Do not use a Centering Catheter balloon size larger than the interventional device size used.
- Difficulty with advancement of the InActive or Active wires may be encountered if the catheter is used in patients with:
  - abnormal or severe vessel tortuosity.
  - lesions located in extremely angulated vessel segments.
- **Saline should be used to inflate the balloon.** Never use air or any other gaseous medium to inflate the balloon. Use of contrast medium to inflate the balloon will make it difficult to visualize Source Wire position and **may attenuate radiation dose.**
- Do not excessively tighten the hemostatic valve. This can prevent the proper advancement of the Source Wire.
- Do not hold the GALILEO™ Centering Catheter while the Source Wire is in transit.
- The SDU is non-sterile. When attaching the GALILEO™ Centering Catheter to the SDU, do not contaminate the sterile field or the sterile Centering Catheter. Avoid contact with the more distal portion of the catheter.
- The SDU will accept only the GALILEO™ Centering Catheter. Do not attempt to insert any other catheter.
- Prepare the GALILEO™ SDU as described in the *GALILEO™ Source Delivery Unit Instructions for Use.*

3.5 SPECIAL CONSIDERATIONS

The GALILEO™ Radiotherapy System has not been evaluated in the following patient or lesion subsets:

- patients with history of previous external radiotherapy to the heart or target vessel area
- coronary artery sites previously treated with radiotherapy
- bifurcation lesions
- saphenous vein grafts or internal mammary bypass grafts
- thrombotic lesions
- patients who experienced a myocardial infarction less than or equal to 72 hours prior to the procedure
- unprotected left main stenosis >50%
- aorto-ostial lesions
- patients with previously diagnosed autoimmune diseases such as rheumatoid arthritis, scleroderma, SLE
- fractionated dose administration other than interruption within the procedure
- patients presenting with multiple vessel lesions
- patients who have received a heart transplant
- patients unable to tolerate the recommended dwell time required by the system

3.6 ADVERSE EVENTS

The Guidant Intravascular Radiotherapy System was evaluated in the INtimal Hyperplasia Inhibition with Beta Instent Trial (INHIBIT), a multi-center, randomized, placebo-controlled trial involving 332 patients. The observed adverse events are summarized in the following table.

Table 1 - Major Adverse Events – Acute and Late Term to 290 days
All Patients Treated (N=332)

Combined (Acute & Late) Complications to 290 days	^{32}P Radiation Patients N=166		Control Patients N=166		All Randomized Patients N=332	
	Number	%	Number	%	Number	%
Hierarchical MACE (Death, MI, TLR)	24	14.5%	51	30.7%	75	22.6%
Hierarchical MACE (Death, MI, TVR)	39	23.5%	56	33.7%	95	28.6%
Death	5	3.0%	5	3.0%	10	3.0%
Myocardial Infarction	13	7.8%	8	4.8%	21	6.3%
Q wave Myocardial Infarction	3	1.8%	3	1.8%	6	1.8%
Non-Q wave Myocardial Infarction	10	6.0%	5	3.0%	15	4.5%
Target Lesion Revascularization	17	10.2%	46	27.7%	63	19.0%
CABG	5	3.0%	20	12.0%	25	7.5%
PTCA	12	7.2%	26	15.7%	38	11.4%
Target Vessel Revascularization	34	20.5%	52	31.3%	86	25.9%
CABG	9	5.4%	23	13.9%	32	9.6%
PTCA	25	15.1%	29	17.5%	54	16.3%
Acute Thrombosis (to 30 days)	3	1.8%	1	0.6%	4	1.2%
Late Thrombosis (31-290 days)	5	3.0%	1	0.6%	6	1.8%
Bleeding complication	4	2.4%	4	2.4%	8	2.4%
Vascular complications	4	2.4%	2	1.2%	6	1.8%

Five (5) patients who received radiation died during the INHIBIT Trial. The deaths occurred between 70 and 281 days. Three deaths were determined to be cardiac deaths. The other two patients experienced sudden death which could not be explicitly adjudicated but acute closure of the target lesion could not be excluded.

The following adverse events were NOT observed during the clinical investigation, but are recognized as potential adverse events associated with interventional cardiology and vascular brachytherapy procedures. The list is not limited to the following:

- arteriovenous fistula
- coronary artery aneurysm
- coronary artery spasm
- coronary vessel dissection, perforation, rupture or injury
- delayed endothelialization
- drug reactions, allergic reaction to contrast media
- embolism
- endocarditis
- hemorrhage or hematoma
- hypo/hypertension
- infection
- loss of vaso-reactivity immediately following treatment
- short-term hemodynamic deterioration

3.7 DEVICE PERFORMANCE

There were 332 patients randomized in the INHIBIT Trial. In the INHIBIT Trial, a modified oncology afterloader was used to deliver the treatment. The GALILEO™ SDU provides the same function as the modified oncology afterloader, but was designed specifically for use in intravascular radiotherapy. The GALILEO™ SDU automates many of the functions performed by the user in the INHIBIT trial. The table below outlines the details of the malfunctions reported as part of the treatment of the 332 patients.

Number of patients enrolled in INHIBIT Trial	332	
Number of cases with unsuccessful delivery of randomized treatment	**18**	**5.4%**
Number of cases with Device Related Malfunctions	10	3.0%
Number of cases with Patient Related Malfunctions	6	1.8%
Number of cases with User Related Malfunctions	2	0.6%
Number of cases reporting initial device malfunction with subsequent treatment success	**6**	**1.8%**
Number of cases with Device Related Malfunctions	6	1.8%
Number of cases with Patient Related Malfunctions	0	0.0%
Number of cases with User Related Malfunctions	0	0.0%

The table below outlines the details of the malfunctions based on the reported device complaints for the first 850 patients (approximation based on GALILEO Centering Catheter International Sales) treated with the commercially available 27 mm GALILEO™ Intravascular Radiotherapy System.

Number of patients treated with the 27 mm GALILEO™ System	850	
Number of cases with unsuccessful delivery of treatment	**1**	**0.1%**
Number of cases with Device Related Malfunctions	1	0.1%
Number of cases with Patient Related Malfunctions	0	0.0%
Number of cases with User Related Malfunctions	0	0.0%
Number of cases reporting initial device malfunction with subsequent treatment success	**7**	**0.8%**
Number of cases with Device Related Malfunctions	3	0.4%
Number of cases with Patient Related Malfunctions	2	0.2%
Number of cases with User Related Malfunctions	2	0.2%

3.8 CLINICAL TRIAL RESULTS

Guidant INHIBIT Trial

The INtimal Hyperplasia Inhibition with Beta In-stent Trial (INHIBIT), a multi-center, randomized, placebo-controlled trial began in August 1998. The acute and 9-month clinical and angiographic results showed that the procedure success rate, defined as delivery of the randomized study treatment, without in-hospital major adverse cardiac event was 93.4%. Major adverse cardiac event (MACE with TLR) was defined by the protocol as death, Q wave MI, target vessel related non-Q wave MI, and target lesion revascularization. During analysis, additional events were added thereby creating MACE with TVR which was defined as death, Q wave MI, target vessel related non-Q wave MI, and revascularization of the target vessel. The Kaplan-Meier estimate of freedom from MACE with TLR at 9 months was 86% in the radiated arm and 69% in the control arm (p=0.0006). The Kaplan-Meier estimate for freedom from MACE with TVR at 9 months was 77% in the radiated arm and 66% in the control arm (p=0.0410).

A total of 332 patients were enrolled at 24 investigational sites in the U.S., Europe, Asia, and Australia. All 332 of the enrolled patients were randomized to receive either the active ^{32}P treatment delivered by the Guidant Intravascular Radiotherapy System (n=166) or a sham control treatment using the same equipment but with a non-radioactive wire (n=166). The primary safety endpoint was defined as MACE with TLR at 9 months and the primary efficacy endpoint was angiographic binary restenosis (defined as ≥ 50% diameter stenosis at follow-up angiography). A clinical events committee, masked to the treatment assignment, adjudicated the major safety endpoints.

Eligible patients, with angina or positive functional study, were identified for elective treatment of in-stent (stainless steel) restenosis in a native coronary artery lesion visually estimated to be between 2.4 and 3.7 mm in diameter. These patients underwent successful percutaneous coronary interventions. Placement of a new stent occurred in 30% (n=101) of the cases. A successful pre-intervention was defined as a final diameter stenosis less than 30% with no major ischemic or procedural complications with an injured length ≤ 47 mm. After the successful intervention, the randomized treatment was administered. If deemed necessary by the clinician, further percutaneous intervention was performed after the randomized treatment.

The Guidant Intravascular Radiotherapy System (an automatic afterloader system) was programmed to deliver a 20 Gy dose to a depth of 1 mm beyond the reference lumen diameter. The radiated and sham control patients had a dwell time based on the source activity of the active wire and the reference lumen diameter that was entered into the afterloader by the radiation staff.

The following recommended drug regimen was evaluated in the INHIBIT Clinical Study:

- Aspirin (ASA) 325 mg daily for one year or per institutional standard, ***and,***
- **For stented patients:** Clopidogrel 75 mg daily for at least 6 months.
- **For non-stented patients:** Clopidogrel 75 mg daily for at least 3 months or Ticlopidine 500 mg loading dose followed by 250 mg twice-daily for one month.

The antiplatelet/anticoagulant medications administered to the 332 patients in the INHIBIT Trial were as follows. These medications were in addition to aspirin daily for one year.

	Duration (Days)									
	< 25		25-99		100-200		> 200		Unknown	
Clopidogrel (75 mg/day)	15	(5%)	88	(27%)	54	(16%)	96	(29%)	11	(3%)
Ticlopidine (250-500 mg/day)	10	(3%)	42	(13%)	2	(1%)	3	(1%)	2	(1%)

Total patients	332	Clopidogrel and Ticlopidine	7 (2%)
Unconfirmed antiplatelet medication	3	Clopidogrel/Ticlopidine not required	13 (4%)
Patients with data available	329		

Clinical follow-up occurred at in-hospital, 1 month, 6 month, and 9 month time points. Angiographic follow-up occurred at 9 months if the patient was asymptomatic or earlier if cardiac symptoms warranted. The study randomization was successful as both treatment groups were found to be demographically equivalent. All randomized patients were included in the intent-to-treat analysis. The principal safety and efficacy results are presented in Table 2 followed by the freedom from MACE with TLR Kaplan-Meier curve and MACE with TVR Kaplan-Meier curve, Figures 1 and 2. The mean lesion length studied was 17.4 mm for all patients (mean lesion length for single position was 13.6 mm and for tandem position was 22.9 mm).

Table 2 - Principal Safety and Efficacy Results

Safety and Efficacy Measures	Radiation N = 166		Control N = 166		Relative Risk [95% C.I.]		Difference [95% C.I.]	
Follow-up (9 month) Stent Segment Restenosis Rate	15.0%	(19/127)	49.2%	(62/126)	0.30	[0.19,0.48]	**-34.2%**	**[-45.0%, -23.5%]***
Follow-up (9 month) Analysis Segment Restenosis Rate	26.4%	(34/129)	51.6%	(66/128)	0.51	[0.37,0.71]	**-25.2%**	**[-36.7%, -13.7%]***
TLR-Free at 290 Days	89.8%		72.3%		1.24	[1.12, 1.38]	**17.5%**	**[9.3%, 25.7%]***
TVR-Free at 290 Days	79.5%		68.7%		1.15	[1.02, 1.32]	**10.8%**	**[1.5%, 20.2%]***
MACE-Free at 290 Days (TLR)	85.5%		69.3%		1.23	[1.10, 1.39]	**16.2%**	**[7.4%, 25.0%]***
MACE-Free at 290 Days (TVR)	76.5%		66.3%		1.15	[1.01, 1.32]	**10.2%**	**[0.6%, 19.9%]***
Procedure Success	92.8%	(154/166)	93.4%	(155/166)	0.99	[0.94, 1.05]	-0.6%	[-6.1%, 4.9%]
Device Success	93.4%	(155/166)	95.8%	(159/166)	0.97	[0.93, 1.03]	-2.4%	[-7.3%, 2.5%]
Post-Procedure Stent Segment Minimal Lumen Diameter (MLD, in mm)								
Mean ± SD (N)	2.16 ± 0.45 (158)		2.21 ± 0.46 (159)				-0.05	[-0.15, 0.05]
Range (min, max)	(0.95,3.44)		(1.07,3.91)					
Post-Procedure Analysis Segment Minimal Lumen Diameter (MLD, in mm)								
Mean ± SD (N)	1.92 ± 0.42 (161)		1.96 ± 0.42 (161)				-0.04	[-0.13, 0.06]
Range (min, max)	(0.97,3.14)		(1.07,3.62)					
Post-Procedure Stent Segment Percent Diameter Stenosis (%DS)								
Mean ± SD (N)	20.8% ± 13.8% (158)		19.1% ± 15.6% (159)				1.72%	[-1.54%, 4.97%]
Range (min, max)	(-30.1%, 50.7%)		(-42.8%, 50.1%)					
Post-Procedure Analysis Segment Percent Diameter Stenosis (%DS)								
Mean ± SD (N)	29.6% ± 10.9% (161)		28.5% ± 11.2% (161)				1.07%	[-1.34%, 3.49%]
Range (min, max)	(6.3%, 57.9%)		(-7.5%, 52.5%)					
Follow-Up Stent Segment Minimal Lumen Diameter (MLD, in mm)								
Mean ± SD (N)	1.91 ± 0.75 (127)		1.46 ± 0.66 (126)				**0.45**	**[0.28, 0.63]***
Range (min, max)	(0.00,3.21)		(0.00,3.31)					
Follow-Up Analysis Segment Minimal Lumen Diameter (MLD, in mm)								
Mean ± SD (N)	1.54 ± 0.65 (129)		1.38 ± 0.61 (128)				**0.16**	**[0.01, 0.31]***
Range (min, max)	(0.00,3.21)		(0.00,3.31)					
Follow-Up Stent Segment Percent Diameter Stenosis (%DS)								
Mean ± SD (N)	29.2% ± 27.4% (127)		48.3% ± 21.0% (126)				**-19.2%**	**[-25.2%, -13.1%]***
Range (min, max)	(-29.7%, 100%)		(-8.4%, 100%)					
Follow-Up Analysis Segment Percent Diameter Stenosis (%DS)								
Mean ± SD (N)	43.3% ± 21.8% (129)		51.3% ± 18.3% (128)				**-8.06%**	**[-13.0%, -3.11%]***
Range (min, max)	(6.4%, 100%)		(11.5%, 100%)					
Safety Measures and Other Clinical Events to 290 Days								
MACE with TLR at 290 Days	14.5%	(24/166)	30.7%	(51/166)	0.47	[0.30, 0.73]	**-16.3%**	**[-25.1%, -7.4%]***
Acute MACE with TLR	2.4%	(4/166)	2.4%	(4/166)	1.0	[0.25, 3.93]	0.0%	[-3.3%, 3.3%]
Late MACE with TLR	12.0%	(20/166)	28.3%	(47/166)	0.43	[0.26, 0.69]	**-16.3%**	**[-24.7%, -7.8%]***
MACE with TVR at 290 Days	23.5%	(39/166)	33.7%	(56/166)	0.70	[0.49, 0.99]	**-10.2%**	**[-19.9%, -0.6%]***
Acute MACE with TVR	2.4%	(4/166)	2.4%	(4/166)	1.0	[0.25, 3.93]	0.0%	[-3.3%, 3.3%]
Late MACE with TVR	21.1%	(35/166)	31.3%	(52/166)	0.67	[0.46, 0.98]	**-10.2%**	**[-19.6%, -0.8%]***
Aneurysm	0%	(0/166)	0%	(0/166)	na		0.0%	
Acute Thrombosis	1.8%	(3/166)	0.6%	(1/166)	3.0	[0.32, 28.6]	1.2%	[-1.1%, 3.5%]
Late Thrombosis	3.0%	(5/166)	0.6%	(1/166)	5.0	[0.59, 42.3]	2.4%	[-0.4%, 5.3%]
Acute Total Occlusions	0.6%	(1/166)	0.6%	(1/166)	1.0	[0.06, 15.9]	0.0%	[-1.7%, 1.7%]
Late Total Occlusions	3.6%	(6/166)	1.2%	(2/166)	3.0	[0.61, 14.7]	2.4%	[-0.9%, 5.7%]

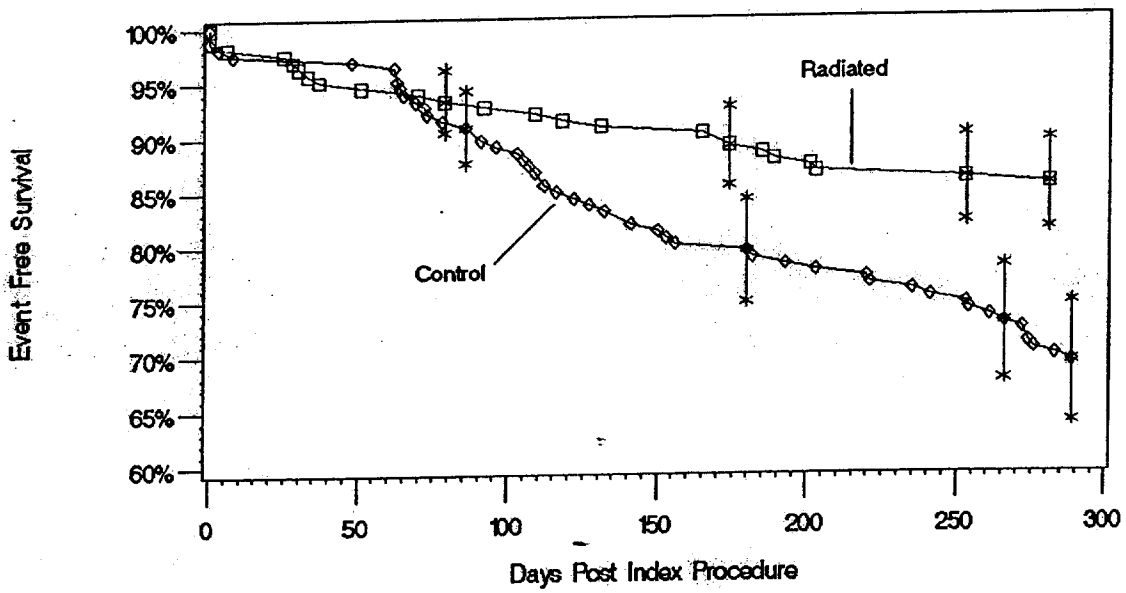
* shows statistically significant difference

Numbers are % (counts/sample size) or Mean ± SD. C.I. = Confidence Interval

Relative risk = Radiated / Control SE = $\text{sqrt}\{(1-p_1)/n_{11}+(1-p_2)/n_{21}\}$ C.I. = $RR*\exp(\pm 1.96*SE)$

Difference = Radiated – Control SE=sqrt ($p_1*q_1/n_1+p_2*q_2/n_2$) C.I. = Diff ± 1.96*SE
Stent Segment (from QCA core lab) = the area confined to the proximal and distal borders of the stent
Analysis Segment (from QCA core lab) = the segment that extends 5 mm proximal and distal to the radiated or injured landmark, whichever was longest in length
Survival estimates from Kaplan-Meier method.
TLR-free = Freedom from target lesion revascularization
TVR = Target vessel revascularization which includes target lesion revascularization
TVR-free = Freedom from target vessel revascularization
MACE-free (TLR) = Freedom from death, Q wave and non-Q wave MI, and target lesion revascularization
MACE-free (TVR) = Freedom from death, Q wave and non-Q wave MI, and target vessel revascularization
Device Success = Successful delivery of the prescribed dose of ^{32}P radiation
Procedure Success = Device Success and hospital discharge without major adverse cardiac event (MACE)
MACE with TLR = composite of death, Q wave and non-Q wave MI, and target lesion revascularization
MACE with TVR = composite of death, Q wave and non-Q wave MI, and target vessel revascularization
Acute = event occurs within 30 days of index procedure
Late = event occurs 31-290 days after index procedure
Aneurysm (from QCA core lab) = an expansion of the lumen by at least 20% compared with the normal lumen dimensions in the treatment region (analysis segment) that extends with a wide or narrow mouth beyond the apparent normal contour
Thrombosis (acute or late) = angiographic thrombus or subacute closure within the target vessel at the time of a clinically driven angiographic restudy for documented ischemia (chest pain and ECG changes
Total Occlusion (acute or late) = an MLD of zero at follow-up as assessed by QCA core lab

Figure 1 - Adverse Events: Death, MI, or TLR - Survival to 290 Days
Event-free Survival ± 1.5 SEM, All Patients Treated (N=332)

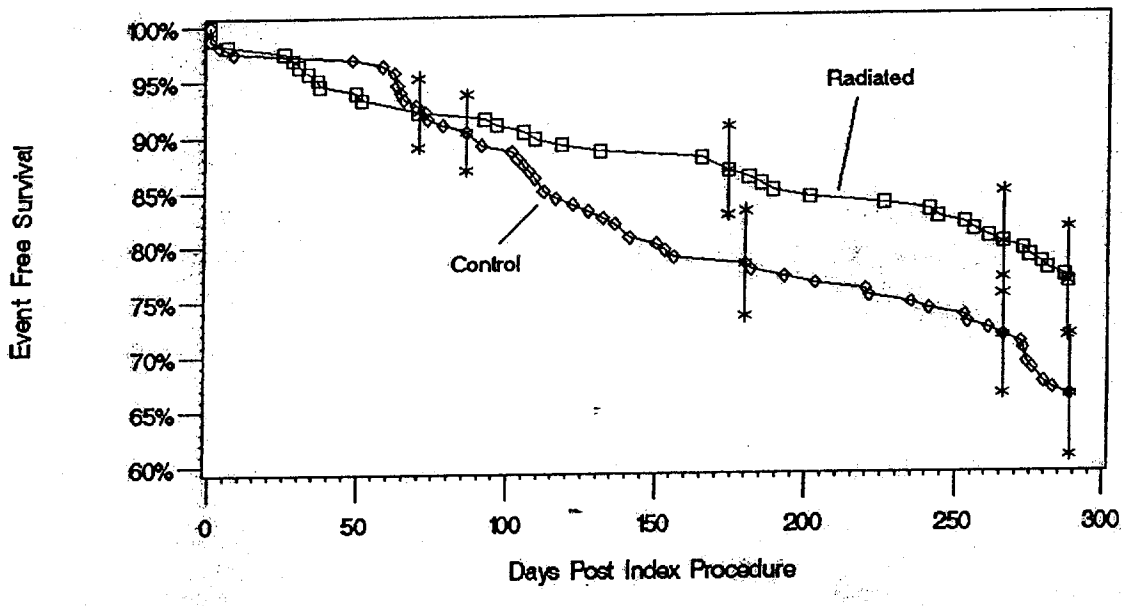


Time After Initial Procedure (days)								
	0	7	14	30	90	180	270	290
Radiated Group								
# At Risk	166	163	163	160	155	148	143	142
# Events	0	3	3	6	11	18	23	24
% Survived	100%	98%	98%	96%	93%	89%	86%	86%
% SEM	0%	1.3%	1.3%	1.5%	1.9%	2.4%	2.7%	2.7%
Control Group								
# At Risk	166	163	162	162	151	132	121	115
# Events	0	3	4	4	15	34	45	51
% Survived	100%	98%	98%	98%	91%	80%	73%	69%
% SEM	0%	1.0%	1.2%	1.2%	2.2%	3.1%	3.5%	3.6%

Tests Between Groups				
	Test	Chi-Square	Degrees Freedom	p-value
	Log-Rank	11.749	1	0.0006
	Wilcoxon	10.840	1	0.0010

Survival percent via product-limit estimates
Between group assessment by both Log-Rank and Wilcoxon Chi-Square

Figure 2 - Adverse Events: Death, MI, or TVR - Survival to 290 Days
Event-free Survival ± 1.5 SEM, All Patients Treated (N=332)



Time After Initial Procedure (days)								
	0	7	14	30	90	180	270	290
Radiated Group								
# At Risk	166	163	163	160	153	144	133	127
# Events	0	3	3	6	13	22	33	39
% Survived	100%	98%	98%	96%	92%	87%	80%	77%
% SEM	0%	1.0%	1.0%	1.5%	2.1%	2.6%	3.1%	3.3%
Control Group								
# At Risk	166	163	162	162	150	130	119	110
# Events	0	3	4	4	16	36	47	56
% Survived	100%	98%	98%	98%	90%	78%	72%	66%
% SEM	0%	1.0%	1.2%	1.2%	2.3%	3.2%	3.5%	3.7%

Tests Between Groups				
	Test	Chi-Square	Degrees Freedom	p-value
	Log-Rank	4.176	1	0.0410
	Wilcoxon	3.978	1	0.0461

Survival percent via product-limit estimates
Between group assessment by both Log-Rank and Wilcoxon Chi-Square

4.0 INSTRUCTIONS FOR USE

4.1 DETAILED DEVICE DESCRIPTION

The GALILEO™ Centering Catheter is intended for use in intravascular radiotherapy in conjunction with the GALILEO™ Source Delivery Unit and Source Wire, collectively referred to as the GALILEO™ Intravascular Radiotherapy System.

The GALILEO™ Centering Catheter is intended to position and center the Source Wire in the vessel lumen.

The GALILEO™ Centering Catheter is a dual-lumen catheter with a spiral-shaped balloon located near the distal tip and is designed for use with the GALILEO™ Source Delivery Unit and Source Wire.

One lumen allows advancement of the Source Wire. The proximal end of this lumen has a single lumen extension tube with a key connector for connection to the Source Delivery Unit. The distal end of this source lumen is closed, preventing contact between the Source Wire and blood.

A second lumen allows inflation and deflation of the centering balloon. This lumen terminates proximally in a luer-lock connector allowing the attachment of standard inflation devices.

A third lumen at the distal tip of the centering catheter allows the centering catheter to be placed over a standard 0.014" (0.36 mm) coronary guide wire using a Rapid Exchange (RX) technique. This lumen runs from the distal tip of the catheter to an exit notch located distal to the balloon. The length of the guide wire lumen is approximately 5 mm.

The spiral design of the centering balloon provides an expanded segment of known diameter while ensuring that the Source Wire remains centrally located within the balloon, thus providing centering of the radioactive Source Wire within the target lesion. In addition, the spiral design may allow distal and side-branch perfusion during balloon inflation. Balloons should be sized to the lumen as described in the Catheter Selection Section.

A radiopaque marker is located near each end of the balloon to aid in positioning the centering catheter. The markers indicate the location where the ends of the radioactive Source Wire will be placed (i.e., Treatment Zone). See Figure 3.

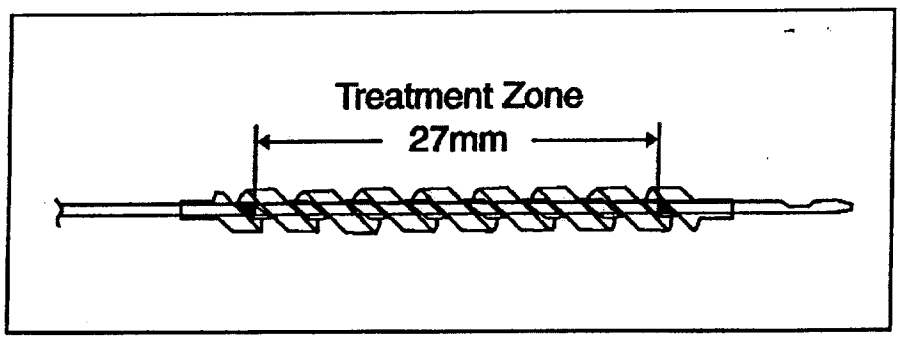


Figure 3 - GALILEO™ Centering Catheter Balloon Marker Location

Proximal shaft markers are located at 95 cm and 105 cm to aid in gauging catheter position relative to the tip of a brachial or femoral guiding catheter, respectively.

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4.2 HOW SUPPLIED

Sterile. Sterilized with electron beam radiation. Non-pyrogenic. Do not use if package is open or damaged.

Contents. One (1) GALILEO™ Centering Catheter, One (1) Primary Flushing Tool (black), One (1) Secondary Flushing Tool (purple).

Storage. Store in a dry, dark, cool place.

4.3 MATERIALS REQUIRED FOR USE WITH THE GALILEO™ CENTERING CATHETER

Multiple Use, Non-Sterile

- GALILEO™ Source Delivery Unit and Source Wire (27 mm)

Single Use Only, Sterile (Do not re-sterilize or reuse.)

- Sterile normal saline (for use as inflation media)
- Sterile heparinized normal saline
- Inflation device
- Hemostatic valve(s)
- Guide wire, maximum 0.014" (0.36 mm)
- Femoral or brachial guiding catheter, minimum 0.075" (1.91 mm) I.D.
- 20 cc Luer-lock syringe (optional)

4.4 CATHETER SELECTION

All measurements of proximal and distal average reference vessel lumen diameters (RLD) and minimum lumen diameter (MLD) may be acquired from any of the following: arteriogram (fluoroscopy), online QCA, IVUS or size of the interventional treatment catheter used. RLD is defined as the average of two diameters - the lumen diameter of the non-diseased vessel immediately proximal and immediately distal to the target treatment area. MLD is defined as the smallest diameter of an artery in a specified segment. The MLD occurs at a specific point, but applies to the entire segment.

Catheter size selection is based on MLD while radiation dose prescription is based upon average RLD. Refer to GALILEO™ SDU IFU for further instructions on determining dose prescription.

Follow these three steps to select the appropriate diameter GALILEO™ Centering Catheter:

Step 1. Determine the length of artery *injured* during the intervention.

CAUTION. The total artery length that has undergone interventional treatment and injury (including post-stent dilatation) must not exceed 47 mm. Total injured arterial lengths ≤ 22 mm can be treated with *single* balloon positioning. Total injured arterial lengths exceeding 22 mm must be treated with *tandem* balloon positioning.

Step 2. Determine the MLD in the region where the centering catheter will be placed. The balloon and the radiation treatment will extend slightly past the artery segment where the intervention was performed. Therefore, attention should also be paid to the MLD just distal to the intervention site when sizing the GALILEO™ Centering Catheter.

For Single Positioning (injured arterial lengths ≤ 22 mm): Determine the MLD within the Planned Irradiated Length (see Figure 4) where the centering catheter will be placed. Proceed to Step 3.

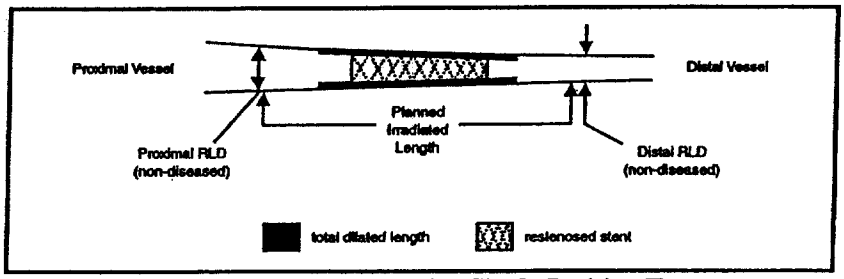

Figure 4 - Terms Used to Describe Single-Position Treatment

For Tandem Positioning (injured arterial lengths > 22 mm and ≤ 47 mm): For treatment of vessel segments of this length, the GALILEO™ Centering Catheter is first placed in the distal vessel segment to be treated, followed by the proximal segment. Refer to Figure 5 for the terms used to describe treatment of long lesions (≤ 47 mm).

Step 2.1 Determine the Total Planned Irradiated Length of artery to be treated.

Step 2.2 Determine the Midpoint of the Total Planned Irradiated Length of artery to be treated.

Step 2.3 Determine the MLD in the Distal Segment and refer to Table 3 in Step 3 for catheter size selection.

Step 2.4 Determine the MLD in the Proximal Segment and refer to Table 3 in Step 3 for catheter size selection.

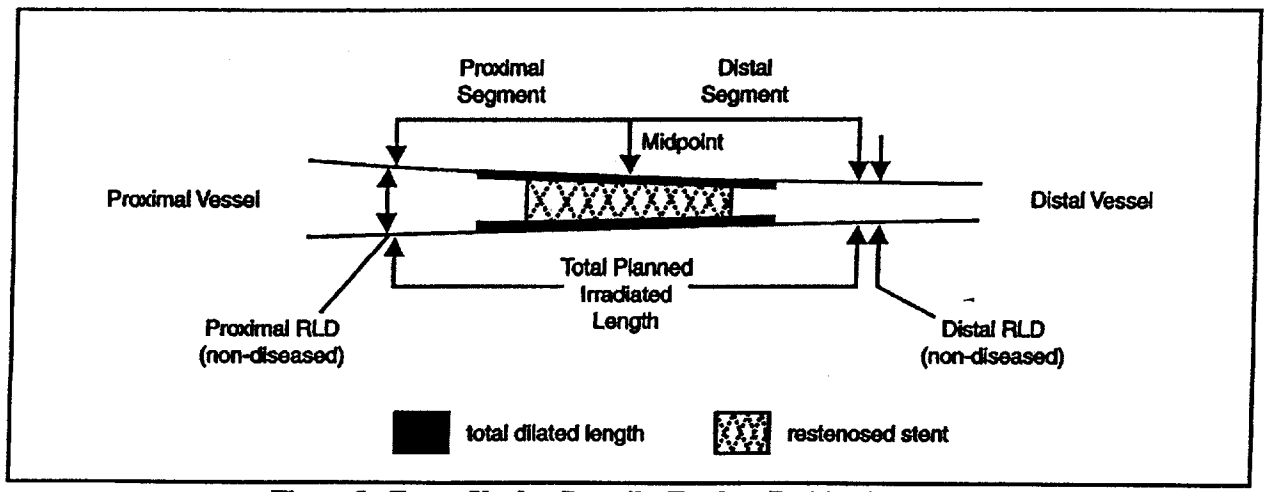

Figure 5 - Terms Used to Describe Tandem-Position Treatment

NOTE. Due to the natural tapering of vessels, the MLD of the Distal and Proximal Segments should be sized separately and thus the GALILEO™ Centering Catheter may need to be exchanged for a larger balloon size when moving from the Distal Segment to the Proximal Segment.

Step 3. Select the GALILEO™ Centering Catheter using Table 3 below:

Table 3 - Balloon Diameter Selection

Balloon Diameter	MLD
2.5 mm	2.25 - 2.75 mm
3.0 mm	2.75 - 3.25 mm
3.5 mm	3.25 - 3.7 mm

CAUTION. Under-sizing the GALILEO™ Centering Catheter may result in a higher radiation dose to one side of the lumen and a concurrent lower dose to the opposite side.

CAUTION. Over-sizing the GALILEO™ Centering Catheter may result in reduced perfusion flow and may dilate the vessel.

4.5 INSPECTION PRIOR TO USE

Prior to using the GALILEO™ Centering Catheter, carefully remove it from the package and inspect for bends, kinks, and other damage. Do not use if defects are noted.

4.6 PREPARATION FOR USE

1. Flush the GALILEO™ Centering Catheter:

   a. Attach a syringe filled with sterile heparinized normal saline to the primary flushing tool (black), which is attached to the protective balloon sheath, and inject sterile heparinized normal saline into the lumen, OR

   b. Attach a syringe filled with sterile heparinized normal saline to the secondary flushing tool (purple), insert the flushing tool into the distal end of the centering catheter and inject sterile heparinized normal saline until fluid exits guide wire exit notch. Follow this procedure for subsequent flushing.

   CAUTION. Do not flush the Source Wire lumen. The Source Wire lumen is a closed end, dry lumen. During the procedure, care should be taken to prevent contaminating the catheter connector key (and GALILEO™ Source Delivery Unit) with blood or other fluids.

2. Slide the protective sheath off the balloon.

3. Prepare an inflation device with sterile normal saline according to the manufacturer's instructions.

   NOTE. Do not use radiopaque contrast as the inflation medium, as this will make the positioning wire difficult to see under fluoroscopy and may result in improper positioning of the radiation Source Wire. Radiopaque contrast may also attenuate the radiation dose.

4. Evacuate air from the balloon segment using the following procedure:

   a. Fill a 20 cc syringe or inflation device with approximately 4 cc sterile normal saline.

   b. After attaching the syringe or inflation device to the balloon inflation lumen, orient the centering catheter with the distal tip and the balloon pointing in a downward vertical position.

c. Apply negative pressure and aspirate for approximately 15 seconds. Slowly release the pressure to neutral, allowing saline to fill the shaft of the GALILEO™ Centering Catheter.

d. Disconnect the syringe or inflation device from the inflation port of the GALILEO™ Centering Catheter.

e. Remove all air from the syringe or inflation device barrel. Reconnect the syringe or inflation device to the inflation port of the GALILEO™ Centering Catheter. Maintain negative pressure on the balloon until air no longer returns to the device.

f. Slowly release the device pressure to neutral.

g. Disconnect the 20 cc syringe (if used) and connect the inflation device to the inflation port of the GALILEO™ Centering Catheter without introducing air into the system.

h. **CAUTION.** All air must be removed from the balloon and displaced with saline before inserting into the body. The presence of air could negatively impact the delivered radiation dose.

4.7 INSTRUCTIONS FOR USE

For placement and support of the GALILEO™ Centering Catheter, it is recommended that this device be inserted into the arterial system through a guiding catheter with a minimum ID of 0.075" (1.91 mm) using standard percutaneous techniques.

1. Advance the GALILEO™ Centering Catheter over the guide wire to the area of the target lesion.

   For Single Position Procedures: Under fluoroscopy, center the balloon across the injured arterial area using the radiopaque markers for guidance.

   For Tandem Positioning Procedures: Under fluoroscopy, advance the appropriately sized balloon into the Distal Segment first by aligning the *proximal* radiopaque balloon marker with the Midpoint of the Total Planned Irradiated Length (see Figure 5).

   NOTE. Do not advance the centering catheter over the floppy portion of the guide wire. If the centering catheter is inadvertently advanced over the floppy portion of the guide wire, pull the centering catheter back onto a more supportive section of the guide wire or, alternatively, advance the guide wire further distally.

   NOTE. If the guide wire starts to prolapse during centering catheter positioning, maintain centering catheter position and gently pull back guide wire. If unable to resolve prolapse, simultaneously advance centering catheter and gently pull back guide wire. If necessary, continue until centering catheter disengages from guide wire, remove centering catheter, and resolve prolapse. If unable to advance centering catheter, withdraw and remove guide wire and then remove centering catheter.

2. Tighten the hemostatic valve just enough to prevent bleed back. Do not over-tighten the hemostatic valve, as this can inhibit the proper advancement of the Source Wire.

3. Attach the centering catheter key connector to the GALILEO™ Source Delivery Unit. Refer to the GALILEO™ Source Delivery Unit instructions for use for details.

   NOTE. The GALILEO™ Source Delivery Unit is NOT sterile. Appropriate sterile procedures should be followed in making the connection. Care should also be taken to avoid contamination of the GALILEO™ Source Delivery Unit with blood.

4. Inflate the centering balloon to 4 atm. **The inflated balloon is not visible on fluoroscopy.** Verify balloon inflation by injecting contrast through the guiding catheter and observing blood flow around the spiral balloon.

   NOTE. Due to anatomical differences between patients, there will be variations in the amount of distal and side-branch flow observed.

   NOTE. Actively monitor and maintain pressure at 4 atm throughout the radiotherapy procedure.

5. Perform the radiotherapy procedure according to the instructions for use supplied with the GALILEO™ Source Delivery Unit.

   NOTE. If symptoms of ischemia occur, the treatment may be interrupted and the balloon deflated until the symptoms pass. Do not deflate the balloon until the Source Delivery Unit has indicated that the Source Wire has been fully retracted.

6. At the completion of the treatment dwell time, deflate the balloon.

   CAUTION. Fully deflate the balloon by maintaining negative pressure with the inflation device whenever the centering catheter is advanced or withdrawn. Contrast injection through the guiding catheter must be used to verify balloon deflation.

7. The next step in the procedure depends upon whether or not tandem balloon positioning is required:

   For Single Position Procedures: the procedure is complete. Remove the centering catheter using standard percutaneous techniques.

   NOTE. Exercise additional precaution as the centering catheter balloon and tip are withdrawn past the ostium. If the guide wire starts to prolapse during centering catheter removal, maintain centering catheter position and gently pull back guide wire. If unable to resolve prolapse, simultaneously advance centering catheter and gently pull back guide wire. If necessary, continue until centering catheter disengages from guide wire, remove centering catheter, and resolve prolapse. If unable to advance centering catheter, withdraw and remove guide wire and then remove centering catheter.

   For Tandem Positioning Procedures: following the Distal Segment treatment dwell time, the source wire will be retracted automatically by the GALILEO™ Source Delivery Unit. The GALILEO™ Centering Catheter should then be deflated. The Proximal Segment is then treated as follows:

   7.1 Place the appropriate centering catheter in the Proximal Segment by positioning the distal radiopaque balloon marker at the Midpoint of the Total Planned Irradiated Length. Ideal balloon positioning is achieved when there is no gap or overlap between the Distal and Proximal Segments. Refer to Figure 6, Figure 7, and Figure 8 for depictions of ideal positioning, allowable gap and allowable overlap, respectively.

   - If the Proximal Segment requires a different centering balloon diameter than the Distal Segment, remove the original centering catheter, disconnect the catheter key connector from the GALILEO™ Source Delivery Unit and replace with a second, appropriately sized centering catheter.

   - If the Proximal Segment can be treated with the same balloon diameter as the Distal Segment, retract the centering catheter 27 mm and disconnect the catheter key connector from the GALILEO™ Source Delivery Unit.

7.2 Re-connect the catheter key connector from the GALILEO™ Source Delivery Unit when instructed to do so by the touch screen.

CAUTION. The portion of the catheter key which has been in contact with the GALILEO™ Source Delivery Unit will NOT be sterile. Care should be taken to avoid contamination of the sterile field.

NOTE. Due to the natural tapering of vessels, the MLD of the Distal and Proximal Segments should be sized separately, as described under CATHETER SELECTION. Therefore, the GALILEO™ Centering Catheter may need to be exchanged for a larger balloon size when moving from the Distal Segment to the Proximal Segment.

CAUTION. In clinical practice some gap or overlap between the Distal and Proximal Segments may occur. However, at no time should an overlap exceeding 2 mm or a gap exceeding 1 mm be allowed. An overlap will increase the dose delivered to the overlap region, while a gap will decrease the dose delivered to the treated area. To avoid excessive gap or overlap during tandem balloon positioning, attention should be paid to the location of the proximal radiopaque marker with respect to side branches or other anatomical landmarks during the distal segment balloon positioning. These landmarks can be used for reference when positioning the catheter for the proximal segment balloon positioning.

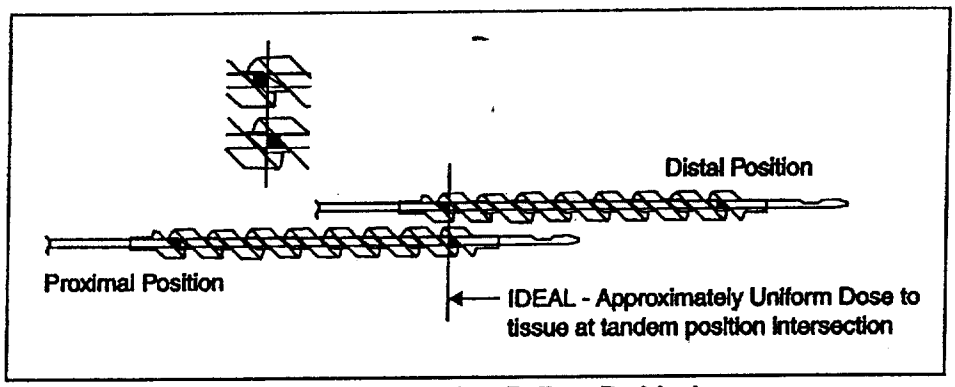

Figure 6 - Ideal Tandem Balloon Positioning

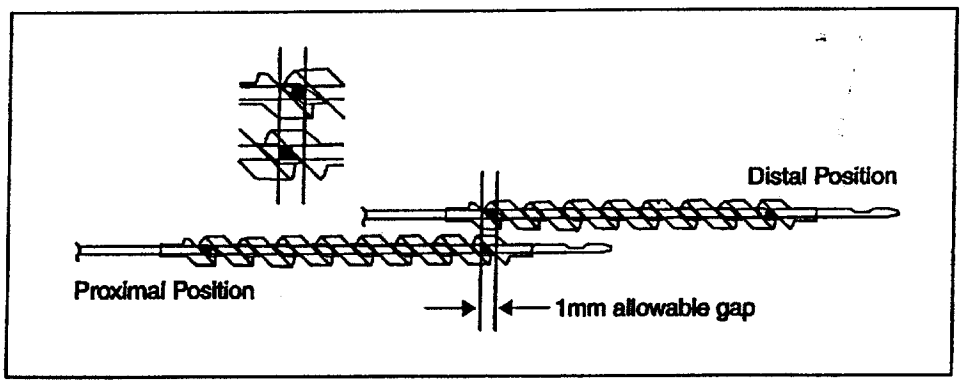

Figure 7 - Allowable Gap During Tandem Balloon Positioning

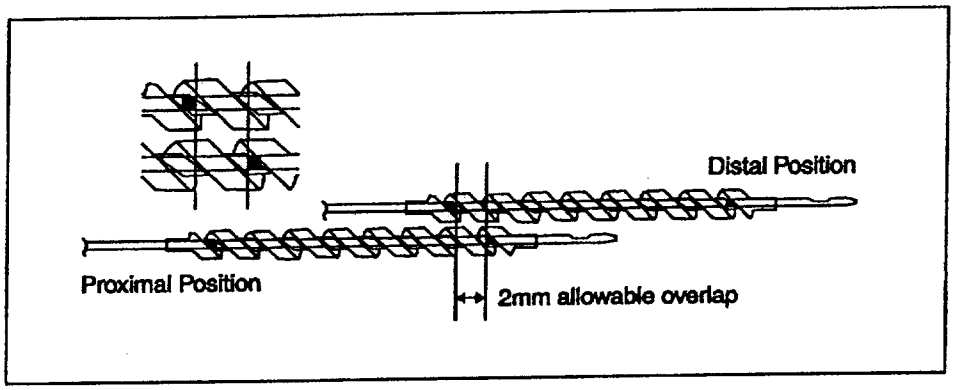

Figure 8- Allowable Overlap During Tandem Balloon Positioning

At the completion of the second treatment dwell time, deflate the balloon and remove the centering catheter using standard percutaneous techniques.

5.0 REFERENCES

Condado, JA, R Waksman, O Gurdiel, R Espinosa, J Gonzalez, B Burger, G Villoria, H Acquatella, IR Crocker, KB Seung, and SF Liprie: Long-term Angiographic and Clinical Outcome After Percutaneous Transluminal Coronary Angioplasty and Intracoronary Radiation Therapy in Humans. *Circulation*, 96(3):727-732, 1997.

Liermann D, HD Bottcher, J Kollath, B Schopohl, G Strassmann, EP Strecker, and KH Breddin: Prophylactic Endovascular Radiotherapy to Prevent Intimal Hyperplasia after Stent Implantation in Femoropopliteal Arteries. *Cardiovascular and Interventional Radiology*, 17:12-16, 1994.

Albert E. Raizner, Stephen N. Oesterle, Ron Waksman, Patrick W. Serruys, Antonio Colombo, Yean-Leng Lim, Alan C. Yeung, Wim J. van der Giessen, Lynn Vandertie, Joseph K. Chiu, Larry R. White, Peter J. Fitzgerald, Grzegorz L. Kaluza, and Nadir M. Ali: Inhibition of Restenosis With ß-Emitting Radiotherapy: Report of the Proliferation Reduction With Vascular Energy Trial (PREVENT). Circulation 2000 102: 951-958.

Teirstein PS, V Massullo, S Jani, JJ Popma, GS Mintz, RJ Russo, RA Schatz, EM Guarneri, S Steuterman, NB Morris, MB Leon, and P Tripuraneni: Catheter-based Radiotherapy to Inhibit Restenosis After Coronary Stenting. *The New England Journal of Medicine*, 336(24):1697-1703, 1997.

Teirstein PS, Massullo V, Jani S, et al. Two-year Follow-up After Catheter-Based Radiotherapy to Inhibit Coronary Restenosis. *Circulation 1999; 99: 243-7.*

6.0 PATENTS

This product and its use are protected by one or more of the following patents. United States, 5,092,834; 5,103,395; 5,139,473; 5,199,939 B1; 5,624,372; 5,643,171; 5,782,741; 5,782,749; 5,807,231; 5,851,172; 5,882,291; 6,048,300; 6,053,858; 6,283,910.

Other U.S. patents pending. Foreign patents issued and pending.

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