ON-X® PROSTHETIC HEART VALVE, MODELS ONXA, ONXM and ONXMC
Instructions for Use

English

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Instructions for Use

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

1. DEVICE DESCRIPTION

The On-X® Prosthetic Heart Valve (Figure 1) is a bileaflet mechanical heart valve, which consists of an orifice housing and two leaflets. The orifice inflow area has a flared inlet designed to reduce flow turbulence, and the outflow rim consists of leaflet guards designed to protect the leaflets while in the closed position. The leaflets rotate around tabs located within the inner circumference of the orifice ring. In the closed position, each leaflet forms a nominal angle of 40° relative to the plane of the orifice. In the open position, the plane of each leaflet forms a nominal angle of 90° relative to the plane of the orifice. The leaflets have a travel arc of 50° to the closed position.

The orifice is composed of graphite substrate coated with On-X® Carbon, a pure unalloyed form of pyrolytic carbon. The leaflets consist of On-X® Carbon deposited on a graphite substrate, which is impregnated with 10 weight% tungsten to provide radiopacity.

The sewing cuff is constructed of polytetrafluoroethylene (PTFE) fabric mounted on the orifice using titanium retaining rings and 5-0 suture material. This form of sewing cuff attachment to the orifice allows for rotation of the sewing cuff *in situ* during implantation. Orientation reference marks are provided on the sewing ring for valve orientation.

The On-X® Prosthetic Heart Valve is available in aortic sizes 19, 21, 23, 25, and 27/29 mm, in mitral sizes 25, 27/29, 31/33 and 25/33. Aortic valve sizes 19 mm through 25 mm are designed for supra-annular implantation, while the valve size 27/29 mm is designed for intra-annular implantation. All mitral valve sizes are designed for supra-annular placement.

2. INDICATIONS FOR USE

The On-X® Prosthetic Heart Valve is indicated for the replacement of diseased, damaged, or malfunctioning native or prosthetic heart valves in the aortic and mitral positions.

3. CONTRAINDICATIONS

The On-X® Prosthetic Heart Valve is contraindicated for patients unable to tolerate anticoagulation therapy.

4. WARNINGS AND PRECAUTIONS

4.1 Warnings

FOR SINGLE USE ONLY.

DO NOT use the On-X® Prosthetic Heart Valve if:

- the prosthesis has been dropped, damaged, or mishandled in any way;
- the expiration date has elapsed;
- the tamper evident seal is broken;
- the serial number tag does not match the container label.

DO NOT resterilize any On-X® Prosthetic Heart Valve:

- once it is removed from its plastic container;
- more than 3 times - resterilization of a valve which has passed the sterility expiration date is permitted, up to this limit, only if the valve has remained in the original unopened container and is undamaged;
- with any method other than steam sterilization, with the identified resterilization parameters. Note: Gamma radiation is known to damage the sewing ring.

DO NOT pass a catheter, surgical instrument, or transvenous pacing lead through the prosthesis as this may cause valvular insufficiency, leaflet damage, leaflet dislodgment, and/or catheter/instrument/lead entrapment.

4.2 Precautions

Handle the prosthesis with only MCRI™ On-X® Prosthetic Heart Valve Instruments. Only MCRI™ On-X® Prosthetic Heart Valve sizers should be used during the selection of the valve size; other sizers may result in improper valve selection.

Avoid contacting the carbon surfaces of the valve with gloved fingers or any metallic or abrasive instruments as they may cause damage to the valve surface not seen with the unaided eye that may lead to accelerated valve structural dysfunction, leaflet escape, or serve as a nidus for thrombus formation.

Avoid damaging the prosthesis through the application of excessive force to the valve orifice or leaflets.

5. ADVERSE EVENTS

A total of 184 aortic On-X® Prosthetic Heart Valves were implanted in 184 patients at 11 centers. The mean follow-up was 2.2 years (range of 0 to 4.0 years) with a total of 411.8 patient-years. In the mitral position 229 valves were implanted in 229 patients at 16 centers. Mean mitral follow-up was 1.8 years (range of 0 to 4.5 years) with a total of 417.9 patient-years.

In aortic patients, a total of 7 deaths occurred during the study and 2 of these were characterized as valve-related. The causes of the aortic valve-related deaths were early thromboembolism (1 patient) and sudden, unexplained death (1 patient). In mitral patients, a total of 18 deaths occurred during the study and 3 of these were characterized as valve-related. The causes of the mitral valve-related deaths were early, uncontrolled bleeding (1 patient) and sudden, unexplained death (2 patients).

5.1 Observed Adverse Events

Adverse events were reported in the clinical study as shown in the following tables.

Table 1: Aortic Replacement Observed Adverse Event Rates[1]

All patients implanted, N = 184, Cumulative follow-up = 411.8 patient-years

Complication	Early Events		Late Events[2]		Freedom from Event[3], % [SE]	
	n	% (n/N)[4]	n	%/pt-yr	1Year Postoperative (n=138)	3 Year Postoperative (n=37)
Mortality (all)	4	2.2%	3	0.7%	97.8% [1.1]	96.0% [1.5]
Mortality (valve-related)	1	0.5%	1	0.2%	99.4% [0.5]	98.8% [0.9]
Endocarditis	0	0.0%	2	0.5%	99.4% [0.6]	98.9% [0.8]
Explant	1	0.5%	2	0.5%	98.4% [0.9]	97.8% [1.1]
Hemolysis[5]	0	0.0%	0	0.0%	100.0% [0]	100.0%[0]
Hemorrhage[6] (all)	1	0.5%	3	0.7%	99.4% [0.5]	97.3% [1.4]
Hemorrhage (major)	1	0.5%	1	0.2%	100.0% [0]	99.1% [0.9]
Perivalvular Leak (all)	4	2.2%	3	0.7%	96.7% [1.3]	96.7% [1.3]
Perivalvular Leak (major)	1	0.5%	0	0.0%	100.0% [0]	100.0% [0]
Nonstructural Valve Dysfunction	0	0.0%	0	0.0%	100.0% [0]	100.0% [0]
Reoperation (valve-related)	2	1.1%	3	0.7%	97.8% [1.1]	97.2% [1.2]
Structural Valve Dysfunction	0	0.0%	0	0.0%	100.0% [0]	100.0% [0]
Thromboembolism	1	0.5%	7	1.7%	97.8% [1.1]	93.9% [2.5]
Thrombosis	0	0.0%	0	0.0%	100.0% [0]	100.0% [0]

Table 2: Mitral Replacement Observed Adverse Event Rates[1]

All patients implanted, N = 229, Cumulative follow-up = 417.9 patient-years

Complication	Early Events		Late Events[2]		Freedom from Event[3], % [SE]	
	n	% (n/N)[4]	n	%/pt-yr	1Year Postoperative (n=134)	3 Year Postoperative (n=44)
Mortality (all)	9	3.9%	9	2.2%	95.4%[1.4]	89.2%[2.7]
Mortality (valve-related)	1	0.4%	2	0.5%	99.5%[0.5]	97.2%[1.7]
Endocarditis	0	0.0%	3	0.7%	99.0%[0.7]	99.0%[0.7]
Explant	1	0.4%	3	0.7%	98.0%[1.0]	98.0%[1.0]
Hemolysis[5]	0	0.0%	0	0.0%	100.0%[0]	100.0%[0]
Hemorrhage[6] (all)	4	1.8%	6	1.4%	96.4%[1.3]	94.4%[2.0]
Hemorrhage (major)	4	1.8%	2	0.5%	97.0%[1.2]	97.0%[1.2]
Perivalvular Leak (all)	2	0.9%	3	0.7%	98.0%[1.0]	97.1%[1.2]
Perivalvular Leak (major)	1	0.4%	1	0.2%	99.4%[0.6]	99.4%[0.6]
Nonstructural Valve Dysfunction	0	0.0%	1	0.2%	100.0%[0]	99.1%[0.9]
Reoperation (valve-related)	3	1.3%	5	1.2%	97.0%[1.2]	97.0%[1.2]
Structural Valve Dysfunction	0	0.0%	0	0.0%	100.0%[0]	100.0%[0]
Thromboembolism	2	0.9%	7	1.7%	97.0%[1.2]	96.3%[1.4]
Thrombosis	0	0.0%	0	0.0%	100.0%[0]	100.0%[0]

Notes:
1. Data does not include results from double valve replacement.
2. Late events calculated as linearized rates based on total patient-years.
3. Freedom from event was calculated based on the method of Kaplan-Meier. SE = Standard Error.
4. n = number of patients in each category; N = total number of study patients.

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5. Blood studies conducted at a core laboratory established that the valve creates a low level of fully compensated hemolysis typified by an increase in SLDH with a mean within normal range, a decrease in haptoglobin to below normal in 69% AVR and 65% MVR patients at 1-year, and all other analytes within normal range.
6. The anticoagulant agents used were reported. The target International Normalized Ratio was 2.5 to 3.5 in AVR and 3.0 to 4.5 in MVR.

5.2 Potential Adverse Events

Adverse events potentially associated with the use of prosthetic heart valves (in alphabetical order) include, but are not limited to:

- angina
- cardiac arrhythmia
- endocarditis
- heart failure
- hemolysis
- hemolytic anemia
- hemorrhage
- myocardial infarction
- prosthesis leaflet entrapment (impingement)
- prosthesis nonstructural dysfunction
- prosthesis pannus
- prosthesis perivalvular leak
- prosthesis regurgitation
- prosthesis structural dysfunction
- prosthesis thrombosis
- stroke
- thromboembolism

It is possible that these complications could lead to:

- reoperation
- explantation
- permanent disability
- death

6. CLINICAL STUDIES

The On-X® Prosthetic Heart Valve clinical trials were designed to study the safety and effectiveness of the valve in aortic and mitral valve replacement. Patients requiring isolated aortic heart valve replacement were enrolled from 1996 to 2000 at 11 centers in an international multicenter, prospective, non-randomized study with retrospective controls. Patients requiring isolated mitral heart valve replacement were enrolled from 1996 to 2001 at 16 centers in an international multicenter, prospective, non-randomized study with retrospective controls.

The aortic cohort included 184 patients (121 men, 63 women), aged from 20 to 80 years (mean of 60.2 years). The cumulative follow-up was 411.8 patient-years with a mean follow-up of 2.2 years (SD = 0.8 years, range = 0 to 4.0 years). The mitral cohort included 229 patients (86 men, 143 women), aged from 21 to 78 years (mean of 59.2 years). The cumulative follow-up was 417.9 patient-years with a mean follow-up of 1.8 years (SD = 1.3 years, range = 0 to 4.5 years). Tables 3 and 4 present preoperative and operative patient demographics. Figure 2 shows the number of patients implanted versus duration of follow-up. Table 5 presents implant information by valve size, including the number of patients implanted and the number of patient-years.

The safety endpoints captured in the studies were complications; blood analyses were used to confirm the absence or presence of certain complications. The safety results are provided above in Tables 1 and 2. Effectiveness endpoints were New York Heart Association (NYHA) classification and echocardiographic assessments. NYHA and blood data were obtained pre-operatively, intra-operatively, and post-operatively at 3 to 6 months, at one year, and annually thereafter. Hemodynamic data were obtained at discharge and at one year. Tables 6 and 7 present these effectiveness results.

Table 3: Aortic Preoperative Patient Demographics
All patients implanted, N = 184, Cumulative follow-up = 411.8 patient-years

Patient Characteristic		N	% (n/N)[1]
Age at implant in years		60.2 ± 8.4	
Gender:	• Male	121	65.8%
	• Female	63	34.2%
NYHA Classification:	• I	9	4.9%
	• II	91	49.5%
	• III	79	42.9%
	• IV	5	2.7%
	• Unknown	0	0.0%
Valve Lesion:	• Stenosis	86	46.7%
	• Insufficiency	39	21.2%
	• Mixed	59	32.1%
	• Other	0	0%

Table 3 continued: Mitral Preoperative Patient Demographics
All patients implanted, N = 229, Cumulative follow-up = 417.9 patient-years

Patient Characteristic		N	% (n/N)[1]
Age at implant in years		59.2 ± 10.6	
Gender:	• Male	86	37.6%
	• Female	143	62.4%
NYHA Classification:	• I	5	2.2%
	• II	68	29.7%
	• III	134	58.5%
	• IV	18	7.9%
	• Unknown	4	1.7%
Valve Lesion:	• Stenosis	29	12.7%
	• Insufficiency	111	48.5%
	• Mixed	87	38.0%
	• Other	2	0.9%

Notes: 1. n = number of patients in each category; N = total number of study patients.

Table 4: Operative Aortic Patient Demographics
All patients implanted, N = 184, Cumulative follow-up = 411.8 patient-years

Variable	Category[1]	n	% (n/N)[2]
Etiology[3]	Calcific	92	50.0%
	Degenerative	51	27.7%
	Rheumatic	24	13.0%
	Congenital	18	9.8%
	Endocarditis	8	4.4%
	Prosthetic Valve Dysfunction	0	0.0%
	Other	6	3.3%
Concomitant Procedures[3]	None	141	76.7%
	Coronary Artery Bypass Graft	21	11.4%
	Myotomy	10	5.4%
	Mitral Repair	5	2.7%
	Aorta Repair or Replacement	4	2.2%
	Tricuspid Repair	1	0.5%
	Muscle Bridge	1	0.5%
	Tricuspid Replacement	0	0.0%
	Explant of Annuloplasty Ring	0	0.0%
	Maze Procedure	0	0.0%
	Closure of Atrial Appendage	0	0.0%
	Ventricular Aneurysm Repair	0	0.0%
	Other	0	0.0%
Pre-existing Conditions[3]	Systemic Hypertension	90	48.9%
	Hyperlipidemia	83	45.1%
	Angina	42	22.8%
	Coronary Artery Disease	42	22.8%
	Diabetes Mellitus	33	17.9%
	Atrial Arrhythmias	25	13.6%
	Left Ventricular Dysfunction	23	12.5%
	Congestive Heart Failure	22	12.0%
	Myocardial Infarction	12	6.5%
	Cerebrovascular Accident	10	5.4%
	Carotid Artery Disease	7	3.8%
	Endocarditis	4	2.2%
	Cardiomyopathy	3	1.6%
	Pacemaker Implant	2	1.1%
	Coronary Artery Bypass Graft	1	0.5%
	Previous Aortic Valve Replacement	1	0.5%
	Previous Mitral Valve Replacement	0	0.0%
	Other	27	14.8%
Valve Size	19 mm	17	9.2%
	21 mm	35	19.0%
	23 mm	70	38.0%
	25 mm	38	20.6%
	27/29 mm	24	13.0%

Table 4 continued: Operative Mitral Patient Demographics
All patients implanted, N = 229, Cumulative follow-up = 417.9 patient-years

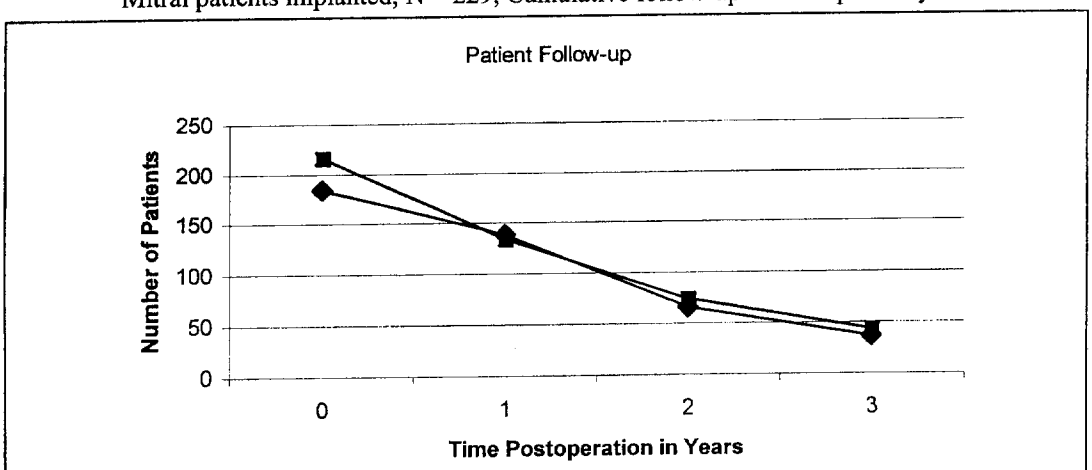
Variable	Category[1]	N	% (n/N)[2]
Etiology[3]	Calcific	36	15.7%
	Degenerative	62	27.1%
	Rheumatic	86	37.6%
	Congenital	4	1.8%
	Endocarditis	16	7.0%
	Prosthetic Valve Dysfunction	6	2.6%
	Other	38	16.6%
Concomitant Procedures[3]	None	130	56.8%
	Coronary Artery Bypass Graft	44	19.2%
	Tricuspid Repair	22	9.6%
	Closure of Atrial Appendage	12	5.2%
	Mitral Repair	12	5.2%
	Maze Procedure	12	5.2%
	Septal Defect Closure	8	3.5%
	Ventricular Aneurysm Repair	3	1.3%
	Muscularization	2	0.9%
	Tricuspid Replacement	1	0.4%
	Explant of Annuloplasty Ring	1	0.4%
Pre-existing Conditions[3]	Atrial Arrhythmias	137	59.3%
	Pulmonary Hypertension	108	46.8%
	Systemic Hypertension	88	38.1%
	Hyperlipidemia	88	38.1%
	Congestive Heart Failure	80	34.6%
	Other	77	33.3%
	Coronary Artery Disease	67	29.0%
	Cigarette Smoker	64	27.7%
	Left Ventricular Dysfunction	47	20.4%
	Cerebrovascular Accident	43	18.6%
	Diabetes Mellitus	40	17.3%
	Angina	38	16.4%
	Myocardial Infarction	30	13.0%
	Hyperthyriodism	27	11.7%
	Chronic Obstructive Pulmonary Disease	25	10.8%
	Endocarditis	18	7.8%
	Gastroinestinal Ulcer	18	7.8%
	Chronic Kidney Failure	13	5.6%
	Carotid Artery Disease	12	5.2%
	Coronary Artery Bypass Graft	10	4.4%
	Cancer	10	4.4%
	Previous Mitral Valve Replacement	9	3.9%
	Cardiomyopathy	8	3.5%
	Pacemaker Implant	6	2.6%
Valve Size	25 mm	33	14.4%
	27/29 mm	131	57.2%
	31/33 mm	65	28.4%

Notes:
1. Ordered by frequency of occurrence, except for valve size.
2. n = number of patients in each category; N = total number of study patients.
3. May be more than one per patient.

Figure 2: Patient Follow-up Over Time

Aortic patients implanted, N = 184, Cumulative follow-up = 411.8 patient-years

Mitral patients implanted, N = 229, Cumulative follow-up = 417.9 patient-years



Patients Followed, N_f		Discharge	1Year Postoperative	2 Year Postoperative	3 Year Postoperative
	Aortic	184	138	66	37
	Mitral	216	134	74	44

Table 5: Number of Aortic Patients Implanted and Number of Patient-years by Valve Size

All patients implanted, N = 184, Cumulative follow-up = 411.8 patient-years

	Numbers by Valve size					
	19 mm	21 mm	23 mm	25 mm	27/29 mm	Total
Number of Patients Implanted	17	35	70	38	24	184
Number of Patient-years	36.9	82.2	151.5	85.9	55.3	411.8

Table 5 continued: Number of Mitral Patients Implanted and Number of Patient-years by Valve Size

All patients implanted, N = 229, Cumulative follow-up = 417.9 patient-years

	Numbers by Valve size					
		25 mm	27/29 mm	31/33 mm		Total
Number of Patients Implanted		33	131	65		229
Number of Patient-years		60.2	239.1	118.6		417.9

Table 6: Aortic Effectiveness Outcomes, Functional New York Heart (NYHA) Classification[1]
All patients implanted, N = 184, Cumulative follow-up = 411.8 patient-years

NYHA Class	Preoperative Assessment (N_d = 184)		Postoperative Assessments					
			1 Year (10-14 Months) (N_f = 138, N_d = 129)[2]		2 Year (22-26 Months) (N_f = 66, N_d = 66)		3 Year (34-38 Months) (N_f = 37, N_d = 36)	
	n[3]	% (n/N_d)	n	% (n/N_d)	n	% (n/N_d)	n	% (n/N_d)
I	9	4.9	83	64.3	48	72.7	20	55.6
II	91	49.5	35	27.1	12	18.2	10	27.8
III	79	42.9	4	3.1	6	9.1	4	11.1
IV	5	2.7	0	0	0	0	0	0
Undetermined[4]	0	0	7	5.4	0	0	2	5.6
Missing[5]	0	N/A	9	N/A	0	N/A	1	N/A

Table 6 continued: Mitral Effectiveness Outcomes, Functional New York Heart (NYHA) Classification[1]
All patients implanted, N = 229, Cumulative follow-up = 417.9 patient-years

NYHA Class	Preoperative Assessment (N_d = 229)		Postoperative Assessments					
			1 Year (10-14 Months) (N_f = 134, N_d = 127)[2]		2 Year (22-26 Months) (N_f = 74, N_d = 69)		3 Year (34-38 Months) (N_f = 44, N_d = 42)	
	n[3]	% (n/N_d)	N	% (n/N_d)	n	% (n/N_d)	N	% (n/N_d)
I	5	2.2	85	66.9	35	50.7	14	33.3
II	68	29.7	29	22.8	24	34.8	22	52.4
III	134	58.5	5	3.9	5	7.2	6	14.3
IV	18	7.9	0	0	1	1.4	0	0
Undetermined[4]	4	1.7	8	6.3	4	5.8	0	0
Missing[5]	0	N/A	7	N/A	5	N/A	2	N/A

Notes:
1. Data does not include results from double valve replacement.
2. N_f = number of patients followed (reproduced from Figure 2); N_d = number of patients for which NYHA datawere collected (not including missing).
3. n = number of patients in each category.
4. Undetermined means data were collected but Class could not be determined during exam
5. Missing refers to the difference between the number of patients followed, N, and the number of patients for which NYHA data were collected, N_d.

Table 7: Effectiveness Outcomes, Aortic Hemodynamic Results[1]

All patients implanted, N = 184, Cumulative follow-up = 411.8 patient-years

Hemodynamic Parameter	Results by Valve Size									
	19 mm		21 mm		23 mm		25 mm		27/29 mm	
Early Postoperation (≤ 30 days), N_E = 184										
Mean Gradient[3]	N_d[4] = 20		N_d = 31		N_d = 58		N_d = 33		N_d = 20	
• Mean ± SD	11.6 ± 4.5		9.4 ± 3.6		8.4 ± 4.3		7.5 ± 3.8		6.1 ± 2.9	
• Min, max	5.6, 21.5		4.0, 18.4		2.0, 26.4		2.1, 18.6		1.0, 11.5	
EOA[5]	N_d = 19		N_d = 31		N_d = 57		N_d = 33		N_d = 20	
• Mean ± SD	1.4 ± 0.2		1.8 ± 0.3		2.1 ± 0.5		2.5 ± 0.8		2.8 ± 0.4	
• Min, max	1.1, 1.9		1.3, 2.4		1.0, 3.6		0.9, 4.3		1.9, 3.5	
Regurgitation[6]	N_d = 22		N_d = 40		N_d = 72		N_d = 38		N_d = 24	
	n[7]	% (n/N_d)	n	% (n/N_d)	n	% (n/N_d)	N	% (n/N_d)	n	% (n/N_d)
• 0	9	40.9%	14	35.0%	31	43.1%	19	50.0%	9	37.5%
• 1-2+	12	54.6%	25	62.5%	37	51.4%	19	50.0%	13	54.2%
• 3+	0	10.0%	0	0.0%	2	2.8%	0	0.0%	0	0.0%
• 4+	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
• Not available	1	4.6%	1	2.5%	2	2.8%	0	0.0%	2	8.3%
1 Year Postoperation, N_E = 138										
Mean Gradient	N_d = 13		N_d = 22		N_d = 55		N_d = 24		N_d = 16	
• Mean ± SD	9.7 ± 2.6		7.7 ± 2.8		6.6 ± 3.0		3.7 ± 2.2		5.6 ± 2.9	
• Min, max	5.7, 14.3		3.1, 15.2		2.0, 16.0		0.5, 11.3		1.0, 10.8	
EOA	N_d = 13		N_d = 22		N_d = 54		N_d = 25		N_d = 16	
• Mean ± SD	1.4 ± 0.3		1.9 ± 0.4		2.3 ± 0.6		2.8 ± 0.8		2.8 ± 0.6	
• Min, max	0.9, 1.8		1.2, 2.9		1.0, 4.1		0.8, 4.2		2.0, 4.1	
Regurgitation	N_d = 16		N_d = 28		N_d = 60		N_d = 30		N_d = 21	
	n	% (n/N_d)	n	% (n/N_d)	n	% (n/N_d)	N	% (n/N_d)	n	% (n/N_d)
• 0	4	25.0%	6	21.4%	24	40.0%	12	40.0%	5	23.8%
• 1-2+	11	68.8%	21	75.0%	33	55.0%	16	53.3%	15	71.4%
• 3+	0	0.0%	0	0.0%	2	3.3%	2	6.7%	1	4.8%
• 4+	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
• Not available	1	6.2%	1	3.6%	1	1.7%	0	0.0%	0	0.0%
> 1 Year Postoperation, N_E = 103 (total of 2 yr (66) and 3 yr (37) follow-up)										
Mean Gradient	N_d = 17		N_d = 29		N_d = 61		N_d = 30		N_d = 18	
• Mean ± SD	9.0 ± 3.2		8.1 ± 3.2		6.6 ± 3.1		4.2 ± 2.5		5.5 ± 3.0	
• Min, max	2.2, 14.3		3.5, 16.6		2.0, 14.1		0.8, 12.8		1.0, 10.8	
EOA	N_d = 17		N_d = 29		N_d = 60		N_d = 31		N_d = 18	
• Mean ± SD	1.5 ± 0.2		1.8 ± 0.5		2.3 ± 0.7		2.7 ± 0.8		2.9 ± 0.8	
• Min, max	0.9, 1.9		0.7, 2.9		1.4, 4.7		0.8, 4.2		2.0, 4.3	
Regurgitation	N_d = 20		N_d = 37		N_d = 68		N_d = 36		N_d = 25	
	n	% (n/N_d)	n	% (n/N_d)	n	% (n/N_d)	N	% (n/N_d)	n	% (n/N_d)
• 0	5	25.0%	9	24.3%	27	39.7%	17	47.2%	7	28.0%
• 1-2+	12	60.0%	25	67.6%	37	54.4%	16	44.4%	17	68.0%
• 3+	2	10.0%	0	0.0%	3	4.4%	2	5.6%	1	4.0%
• 4+	0	0.0%	0	0.0%	0	0.0%	1	2.8%	0	0.0%
• Not available	1	5.0%	3	8.1%	1	1.5%	0	0.0%	0	0.0%

Table 7 continued: Effectiveness Outcomes, Mitral Hemodynamic Results[1]
All patients implanted, N = 229, Cumulative follow-up = 417.9 patient-years

Hemodynamic Parameter	Results by Valve Size						
	25 mm		27/29 mm		31/33 mm		
Early Postoperation (< 30 days), N_f = 216							
Mean Gradient[3]	N_d = 31		N_d = 117		N_d = 59		
• Mean ± SD	4.3 ± 1.3		4.3 ± 1.6		4.5 ± 2.2		
• Min, max	1.7, 7.5		1.2, 10.0		1.0, 11.7		
EOA[5]	N_d = 25		N_d = 97		N_d = 53		
• Mean ± SD	2.4 ± 0.8		2.2 ± 0.6		2.2 ± 0.8		
• Min, max	0.9, 4.2		1.0, 4.3		0.8, 4.4		
Regurgitation[6]	N_d = 28		N_d = 104		N_d = 56		
	n	% (n/N_d)	N	% (n/N_d)	N	% (n/N_d)	
• 0	20	71.4%	73	70.2%	40	71.4%	
• 1-2+	4	14.3%	25	24.0%	16	28.6%	
• 3+	0	0.0%	0	0.0%	0	0.0%	
• 4+	0	0.0%	0	0.0%	0	0.0%	
• Not available	4	14.3%	6	5.8%	0	0.0%	
1 Year Postoperation, N_f = 134							
Mean Gradient	N_d = 18		N_d = 79		N_d = 30		
• Mean ± SD	3.7 ± 2.0		4.4 ± 1.8		4.0 ± 1.5		
• Min, max	1.7, 7.5		1.7, 10.0		2.0, 7.1		
EOA	N_d = 15		N_d = 70		N_d = 28		
• Mean ± SD	2.1 ± 0.6		2.1 ± 0.6		2.1 ± 0.6		
• Min, max	1.2, 3.1		0.9, 4.0		1.4, 4.3		
Regurgitation	N_d = 15		N_d = 66		N_d = 29		
	n	% (n/N_d)	n	% (n/N_d)	N	% (n/N_d)	
• 0	11	73.3%	53	80.3%	23	79.3%	
• 1-2+	3	20.0%	11	16.7%	6	20.7%	
• 3+	1	6.7%	1	1.5%	0	0.0%	
• 4+	0	0.0%	0	0.0%	0	0.0%	
• Not available	0	0.0%	1	1.5%	0	0.0%	

Notes:
1. Hemodynamic evaluations were performed using transthoracic echocardiography (TEE) and in some cases, transesophageal echocardiography (TEE). Data does include results from double valve replacement.
2. N_f = number of patients followed (reproduced from Figure 2).
3. Mean gradient represents the pressure drop measured across the valve in mmHg.
4. N_d = number of patients for which hemodynamic data were collected.
5. EOA = effective orifice area measured in cm^2.
6. Regurgitation represents the valvular backflow of blood due to normal leakage and perivalvular leakage; 0 = none, 1+ = mild, 2+ = moderate, 3+ = moderate/severe, 4+ = severe.
7. n = number of patients in each category.

7. INDIVIDUALIZATION OF TREATMENT

Adequate anticoagulant or anticoagulant/antiplatelet therapy should be administered. Selection of an anticoagulant or anticoagulant/antiplatelet regimen is based on the particular needs of the patient and the clinical situation.

7.1 Specific Patient Populations

The safety and effectiveness of the On-X® Prosthetic Heart Valve has not been established for the following specific populations because it has not been studied in these populations:

- patients who are pregnant;
- nursing mothers;
- patients with chronic endocarditis;
- patients requiring pulmonary or tricuspid replacement.

8. PATIENT COUNSELING

- Prophylactic antibiotic treatment must be provided to all patients with prosthetic valves undergoing dental procedures or other potentially bacteremic procedures.
- Patients require anticoagulation or anticoagulant/antiplatelet therapy.
- Patients should be encouraged to complete the Patient ID card provided with the valve and carry it with them at all times.

9. HOW SUPPLIED

9.1 Available Models and Sizes

The On-X® Prosthetic Heart Valve is available in aortic sizes of 19 mm, 21 mm, 23 mm, 25 mm, and 27/29 mm, in standard mitral sizes 25 mm, 27/29 mm and 31/33 mm, and in Conform-X® size 25/33 mm. The 19 mm through 25 mm aortic valves are designed for supra-annular placement; the 27/29 mm aortic valve is designed for intra-annular placement. The mitral valves are designed for supra-annular placement.

The dimensional and model specifications for all available sizes of the On-X® Prosthetic Heart Valve are shown in Table 8 and Figure 1. The symbol SZ mm on the box, container labels, and implant registration card refers to the tissue annulus diameter of the valve in millimeters.

Table 8: On-X® Valve Specifications (millimeters)

Model Designator	Size/Type	Tissue Annulus (mounting) Diameter	Orifice Internal Diameter	External Sewing Ring Diameter	Profile Height (closed)	Profile Height (open)	Internal Orifice Area
		(A)	(D)	(S)	(h)	(H)	(mm^2)
ONXA-19	19 Aortic	19	17.4	23.0	10.8	13.3	228
ONXA-21	21 Aortic	21	19.4	26.0	11.9	14.7	284
ONXA-23	23 Aortic	23	21.4	29.0	13.1	16.1	344
ONXA-25	25 Aortic	25	23.4	32.0	14.2	17.8	411
ONXA-27/29	27/29 Aortic	27-29	23.4	34.0	14.2	17.8	411
ONXM-25	25 Mitral	25	23.4	33.0	14.2	17.8	411
ONXM-27/29	27/29 Mitral	27-29	23.4	34.0	14.2	17.8	411
ONXM-31/33	31/33 Mitral	31-33	23.4	36.0	14.2	17.8	411
ONXMC-25/33	Conform-X	25-33	23.4	39.0	14.2	17.8	411

Refer to Figure 1 for location of measured dimensions. Values given are nominal within the tolerance band.

9.2 Packaging

The On-X® Prosthetic Heart Valve is provided sterile, mounted on a holder, in a double-sealed plastic container. The package consists of the following items:

- Outer box
- Plastic valve container
- Plastic valve holder
- Instructions for use
- Patient record card
- Implant registration card
- Valve serial number tag

Instruments for implantation of the On-X® Prosthetic Heart Valve are supplied separately, **NON-STERILE**, and must be cleaned and sterilized prior to use as outlined in section 9.5.

9.3 Storage

The On-X® Prosthetic Heart Valve has been qualified for a maximum storage life of 5 years from the date of manufacture. The sterility expiration date of the On-X® Prosthetic Heart Valve is recorded on the outer package label. Appropriate inventory control should be maintained so that prostheses with earlier expiration dates are preferentially implanted and expiration is avoided. To protect the valve, it should be stored in its outer box until used. The storage environment should be clean, cool, and dry.

9.4 Accessories

The On-X® Prosthetic Heart Valve is designed to be used only with MCRI™ On-X® instruments. The instruments, supplied separately, are provided in a kit which include sizers, rotators, a universal instrument handle, and a universal leaflet probe. Sizers and rotators are available for each size On-X® Prosthetic Heart Valve. The instruments are reusable.

CAUTION: Sizers and instrument handles have metallic regions that are bendable. Repeated bending of these metallic regions can lead to fatigue