

## CLINICAL INSIGHTS

### MASTERS SERIES MITRAL MECHANICAL HEART VALVES

# Key Mitral MHV selection considerations: durability, size range, hemodynamics, and implantability<sup>1</sup>

## The Masters Series Mitral Valves Demonstrate Excellent 30-Year Clinical Outcomes

- **DURABILITY:** Masters Series mechanical Heart valves demonstrate long-term durability based on experience of more than 3 million implants<sup>2</sup> over several decades
- **SIZE RANGE & HEMODYNAMICS:** Wide range of sizes (15 to 33 mm) allows for individualizing valve implantation for enhanced hemodynamic performance
- **IMPLANTABILITY:** Low profile reduces protrusion into the left ventricle

### TITLE

Thirty-year experience with a bileaflet mechanical valve prosthesis<sup>1</sup>

### AUTHORS

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### BACKGROUND

Valves in the Masters Series are bileaflet pyrolytic carbon valves available for use in both mitral and aortic positions. In addition to their low profile, Masters valves delivers small transvalvular gradients, low rates of thrombotic events, and few mechanical failures.<sup>1</sup>

### OBJECTIVE

The objective of this study was to evaluate the long-term outcomes of mitral valve replacement with a Masters Series mechanical valve prosthesis.

### METHODS

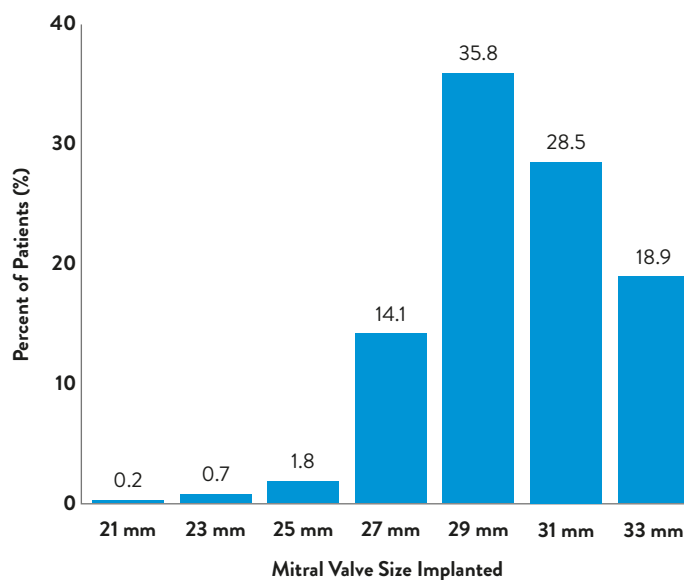
From January 1979 to December 2014, all patients undergoing mechanical mitral valve replacement (N=439) were prospectively entered into a computer database. Patient questionnaires, telephone call, and in-person interviews were used to collect adverse event and mortality data. Follow-up was 95% complete with 4735 total patient years for the MVR cohort.

### RESULTS

Between 1979 and 2014, 439 patients underwent mitral valve replacement with a Masters Series valve. In patients undergoing MVR, late actuarial survival was 64%, 28%, and 14% at 10, 20, and 30 years, respectively. Analysis quantified thirty-year freedom from reoperation (85%), thromboembolism (55%), valve thrombosis (99%), bleeding (57%), and endocarditis (95%). Incidence of bleeding was 2.0% per patient-year and incidence of thromboembolism was 2.9% per patient-year.

### CONCLUSION

The Masters Series of valves continues to demonstrate high reliability after decades of study.<sup>1</sup> Structural failures and reoperation due to device malfunction are rare. These factors combine to make the Masters Series an excellent valve choice for a wide variety of patients.



**Figure 4.** Over 90% of patients in the 30-year study cohort had a size 27 or larger valve implanted during mitral valve replacement.

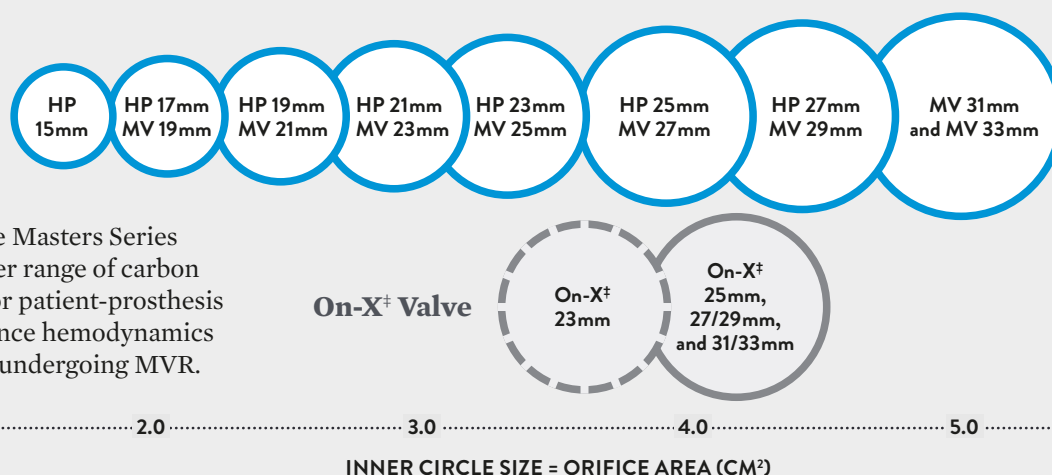
# SIZE RANGE - THE IMPORTANCE OF ORIFICE AREA

## Individualizing Care for Patients Undergoing MVR

Masters Series Valves offer a choice of sizes with relational internal diameters and lower risk of protrusion. Other commercially available valves may offer smaller orifice areas, especially in larger sizes, that may have an impact on hemodynamics. For example, the On-X<sup>+</sup> valve for the mitral position is only manufactured with two

carbon sizes, 23 mm and 25 mm. Patients with larger mitral tissue annuli receive the same sized carbon with bigger versions of a supra-annular flange style cuff or a tapered intra annular cuffs. The result is a smaller effective orifice area than is possible given the size of the patient's natural anatomy.<sup>3,4</sup>

### MASTERS HP (HP) AND MASTERS VALVE (MV)



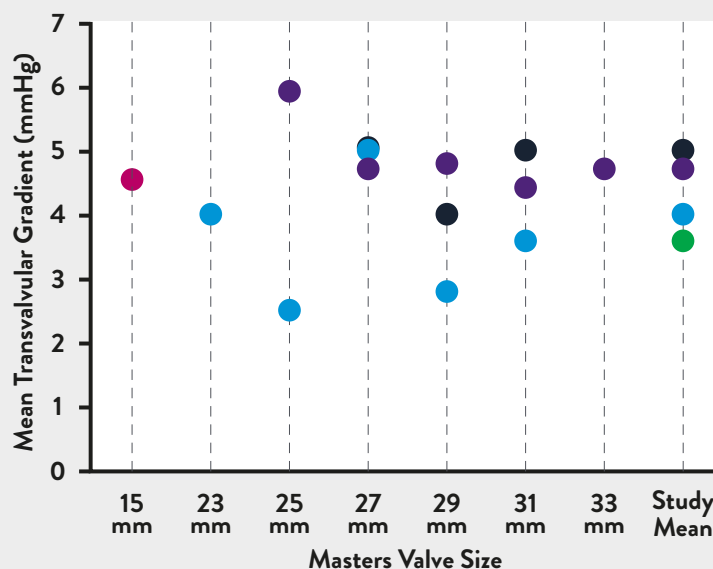
**Figure 2.** The Masters Series offers a wider range of carbon sizes to tailor patient-prosthesis fit and enhance hemodynamics for patients undergoing MVR.

## HEMODYNAMICS - MASTERS VALVE: CONSISTENTLY LOW GRADIENTS ACROSS A WIDE RANGE OF SIZES

The Masters Series has been studied in the mitral position for decades and consistently delivers low gradients across sizes to optimize care based on the patient anatomy (see Figure 3).

Additional *in vitro* testing of Master Series and On-X<sup>+</sup> valves by Evin et al. in 2017, demonstrated lower gradients and larger EOAs with Masters valves than comparably sized On-X<sup>+</sup> devices.<sup>10</sup> For example, in the 29 mm label size, Masters valve delivered a mean transvalvular pressure gradient of  $0.9 \pm 0.1$  mmHg with an EOA of  $3.22 \pm 0.32$  cm², compared to On-X<sup>+</sup> size 27-29/31-33 with  $1.3 \pm 0.1$  mmHg and  $2.53 \pm 0.34$  cm².

**Figure 3. Mean Valve Gradient for MVR with Masters Series by Size**



### Clinical Study

- Panidis, et al. 1986 (N=74)<sup>5</sup>
- Bitar, et al. 1995 (N=40)<sup>6</sup>
- Reisner, et al. 1998 (N=21)<sup>7</sup>
- Blauwet, et al. 2013 (N=368)<sup>8</sup>
- IJsselhof, et al. 2020 (N=17)<sup>9</sup>

# IMPLANTABILITY - THE POTENTIAL IMPACT OF HEIGHT ON PROTRUSION

## Maximize Hemodynamics While Reducing the Risk of LVOT Obstruction

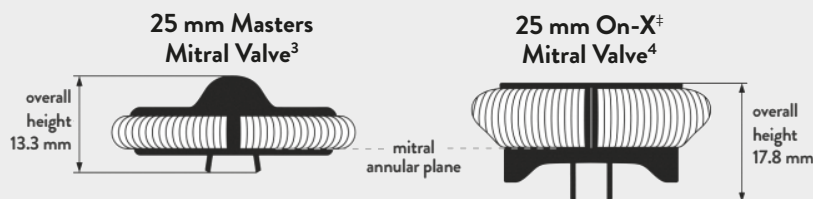
In the mitral position sub-annular valve protrusion can increase the risk of leaflet interference from the sub-valvular anatomy and increase risk of LVOT obstruction. The Masters Series mitral valve's outflow profile is between 2.9 mm and 8.2 mm (depending on size), with the occluding leaflets effectively pulled up-stream by the pivot guards. This upstream pivot location reduces sub annular mitral leaflet protrusion.

In contrast, the On-X<sup>+</sup> valve has a tall, flared, tube-like orifice structure, with the occluding leaflets located in the mid-line. Depending on the cuff and patient's mitral annular size, the On-X<sup>+</sup> sub-annular protrusion or outflow profile, can be as large as 7 mm to 11 mm, resulting in significantly more apparatus in the ventricle.

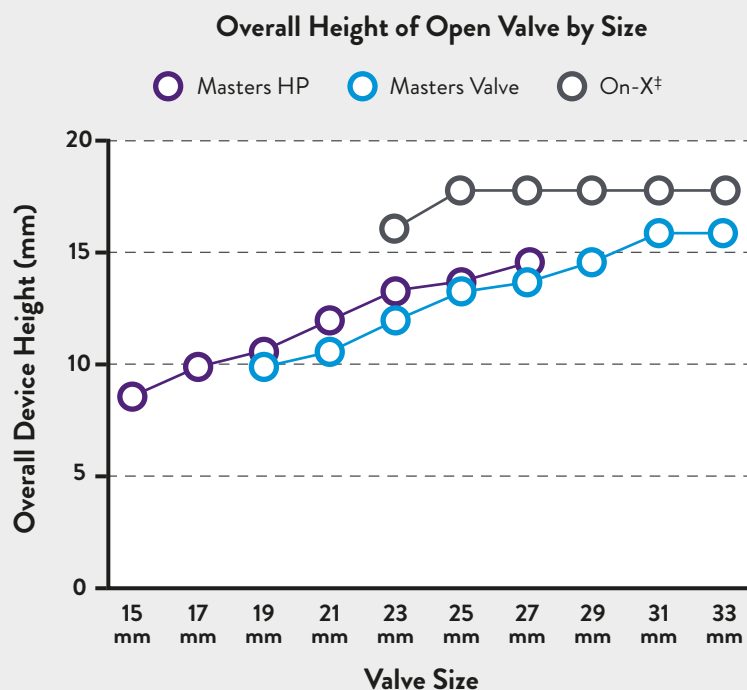
**Additionally, since On-X<sup>+</sup> valves for sizes 25 mm and larger share the same profile height,<sup>4</sup> there may be significantly more protrusion relative to the native anatomy in smaller patients.** This may complicate implantation and impact the performance of the valve depending on its alignment.

**In the commonly used 29 mm mitral valve size Masters valve can have 20% less sub-annular protrusion.**

**Figure 4.** The design and placement of the Masters Series mitral valve results in shorter overall height, can yield less protrusion, and may reduce the risk of entanglement.



**Figure 5.** While the Masters Series valve height varies by size and is short, the On-X<sup>+</sup> device requires significant clearances regardless of the patient's annulus dimensions.



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