

## Valvular Heart Disease: A focus on mitral and aortic valve disease

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## Valvular Heart Disease

- The heart has four main cardiac valves: aortic, mitral, pulmonic, and tricuspid
- Each valve can become diseased through a number of different ways (i.e. infection, degeneration, ischemia, congenital)
- Two main problems that occur with these valves: stenosis (i.e. tightening) or regurgitation (i.e. leaky)



## Specific Valvular Disorders

- Mitral and aortic stenosis and regurgitation are four specific valvular disorders which are seen in varying populations
- Oftentimes, these disorders are seen together but can be separate as well
- All these conditions, if left untreated, can result in heart failure and possible death if severe in nature



## Mitral Stenosis

- MS can be seen in developing countries oftentimes secondary to childhood rheumatic fever
- Results in the valve becoming "tight" and not able to open normally
- Can be diagnosed with PE and echocardiogram
- Valvular manifestations are seen usually well after infection has passed
- Can result in SOB, palpitations (i.e. Afib), and even HF
- Can also be seen in conjunction with mitral regurgitation (MR)

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## Therapy

- Medications to slow HR rate down (beta-blockers, Ca-channel blockers, digoxin) can be used if AF present
- Diuretics can be used for symptoms of SOB
- Balloon mitral valvuloplasty can be curative in certain cases
- If BMV cannot be performed, surgery is usually the only definitive therapy

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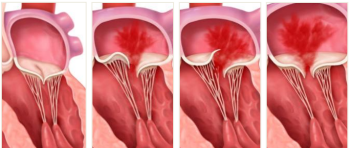
## Mitral Regurgitation

- Affects thousands of Americans
- Vastly undertreated
- Basically means the mitral valve has become “leaky”-- blood spills backwards into the lungs rather than going forward into the left ventricle as a results of weak or “degenerated” mitral leaflets
- Results in progressive shortness of breath, fatigue, and eventual heart failure

## Mitral Regurgitation Etiologies

**Causes**

- Degenerative MR (also known as primary or organic MR) is usually due to an anatomic abnormality of the mitral valve itself, including the leaflets, and/or the subvalvular apparatus, such as the chordae or papillary muscles.
- Functional MR (also known as secondary MR) is the result of left ventricular dilation, which can be secondary to ischemic heart disease. Left ventricular dysfunction leads to annular dilation and incomplete coaptation of the mitral valve resulting in MR.

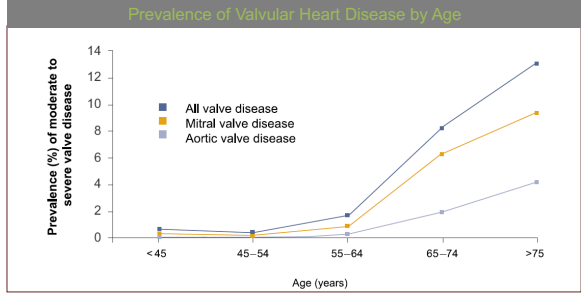


Normal Mitral Valve    Degenerative MR: Prolapse    Degenerative MR: Flail    Functional MR

## Moderate or Severe Valvular Disease Is Common and Increases With Age

**Mitral regurgitation is the most common type of heart valve insufficiency in the US<sup>1,2</sup>**

Prevalence increases with increasing age, from 0.5% for 18-44 yr olds rising to 9.3% for ≥75 year olds (p<.0001)



Age (years)	All valve disease (%)	Mitral valve disease (%)	Aortic valve disease (%)
<45	~0.5	~0.5	~0.5
45-54	~1.0	~1.0	~1.0
55-64	~2.0	~2.0	~2.0
65-74	~6.0	~6.0	~6.0
>75	~9.3	~9.3	~9.3

1. Heart Disease and Stroke Statistics 2010 Update: A Report From the American Heart Association. *Circulation*. 2010;121:e46-e215.  
2. Nkomo et al. Burden of Valvular Heart Diseases: A Population-based Study. *Lancet*, 2006; 368: 1005-11.

## MR Progresses to Heart Failure



<sup>1</sup> Coliff G, et al. Functional mitral regurgitation predicts 1-year mortality in elderly patients with systolic chronic heart failure. *European Journal of Heart Failure* 2005 Dec;7(7):1112-7  
<sup>2</sup> Gigioni F, et al. Outcomes in mitral regurgitation due to flail leaflets: a multicenter European study. *JACC Cardiovasc Imaging*. 2008 Mar;1(2):133-41  
<sup>3</sup> Enriquez-Sarano M, et al. Quantitative determinants of the outcome of asymptomatic mitral regurgitation. *N Engl J Med*. 2005 Mar 3;352(9):875-83

## Diagnosis/Treatment

- Physical exam, history
- Echocardiogram
- Once diagnosis has been established, utilization of anti-HTN medications (including ACEi, Ca-channel blockers, BB, or diuretics) may be used if needed
- Close surveillance follow-up with serial echocardiograms may be done as well
- Potentially, if a patient already has HF, a specialized pacemaker call a Bi-V pacemaker can be used

## Treatment

- Historically, only medical therapy, followed by surgery (if possible) were mainstays of treatment
- Medical therapy with vasodilators/diuretics, though effective in many cases of HTN, cannot reverse degenerative disease
- Surgery is the gold-standard (and still is)
- However, surgery can be high-risk in this population, and needs to be done by a surgeon with the skill/experience to perform a MV replacement/repair (which BCH is fortunate to have—Dr. Mahan)

## Surgery

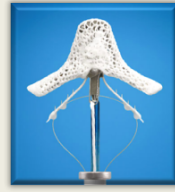
- Gold-standard if medical therapy fails/valve is flail or degenerated
- Can be done via a number of different approaches (i.e. open chest, minimally invasive, lateral) and prognosis is excellent if correction is complete
- No endovascular procedure has rivaled the success rates of surgery
- However, unfortunately, there are a number of patients who cannot have surgery due to a number of co-morbid issues

## MitraClip System

### First-in-class, Leading Technology

The MitraClip System performs percutaneous mitral valve repair by creating a vertical line of coaptation, forming a double-orifice valve.<sup>1,2</sup>

- Beating heart procedure—no cardiopulmonary bypass
- Allows for real-time positioning and repositioning to optimize MR reduction
- Designed to preserve surgical options
- Femoral venous access
- Low hospital length of stay



© MitraClip Clip Delivery System Instructions for Use. See important safety information referenced within.

## Aortic Regurgitation

- “Leaky” aortic valve
- Can be caused by numerous conditions (HTN, congenital issues, infection)
- Diagnosis can be made by PE and echocardiogram
- Can also be found in conjunction with aortic stenosis
- Symptoms can be SOB, and if untreated, can lead to HF

## Therapy

- If HTN is present, medications such as vasodilators (ACEi) can be used
- Diuretics can be used if symptomatic SOB is present
- Ultimately, surgery is the gold-standard if severe AI is present, especially if the aortic root is involved and needs to be replaced

## Aortic Stenosis

- Aortic stenosis (AS) can be seen earlier in life as a congenital issue (i.e. bicuspid valve), but is more often seen as a calcific, age-related issue
- Calcific aortic stenosis—a very real problem in the U.S, and especially in patients >65 years old
- Results in closure of the aortic valve, which causes progressive angina, syncope, light-headedness, and eventual heart failure/death
- Diagnosis can be made by PE and echocardiogram

## Prevalence of Aortic Stenosis

- Aortic stenosis is estimated to be prevalent in up to 7% of the population over the age of 65<sup>1</sup>
- It is more likely to affect men than women; 80% of adults with symptomatic aortic stenosis are male<sup>3</sup>

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## Aortic Stenosis Demographics

- Aortic stenosis 2% US population >65yrs old
- Aortic sclerosis 29% US population > 65 yrs old
- Aortic sclerosis 50% greater risk of mortality and myocardial infarction.
- Aortic sclerosis progresses to aortic stenosis in 9% over 5 years

**Progressive Risk Factors to Disease**  
 Metabolic Syndrome  
 Obesity  
 Hypertension  
 Smoking  
 Renal Failure  
 Hyperlipidemia  
 Male Gender  
 Oxidative Stress  
 Age

Normal Aortic Valve → Aortic Valve Sclerosis → Calcific Aortic Valve Disease

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## What Causes Aortic Stenosis in Adults?

More Common

Less Common

- Age-Related Calcific Aortic Stenosis**

Aortic stenosis in patients over the age of 65 is usually caused by calcific (calcium) deposits associated with aging
- Rheumatic Fever**

Adults who have had rheumatic fever may also be at risk for aortic stenosis
- Congenital Abnormality**

In some cases adults may develop aortic stenosis resulting from a congenital abnormality

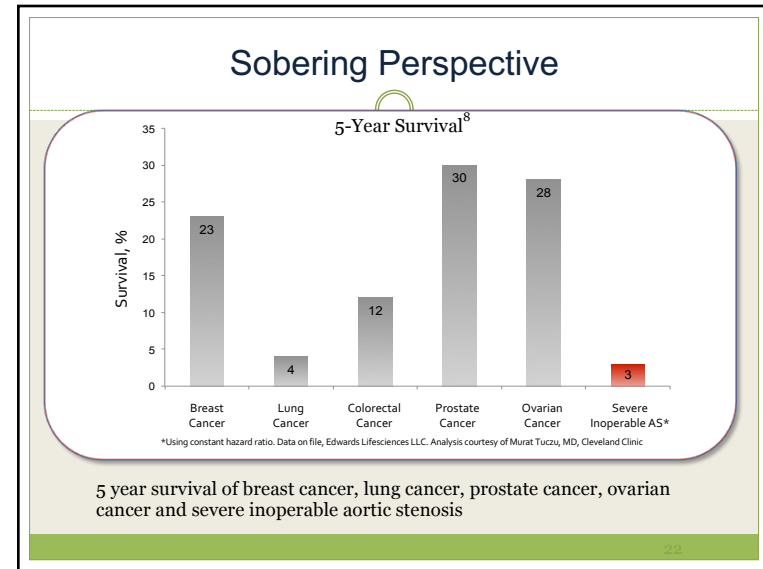
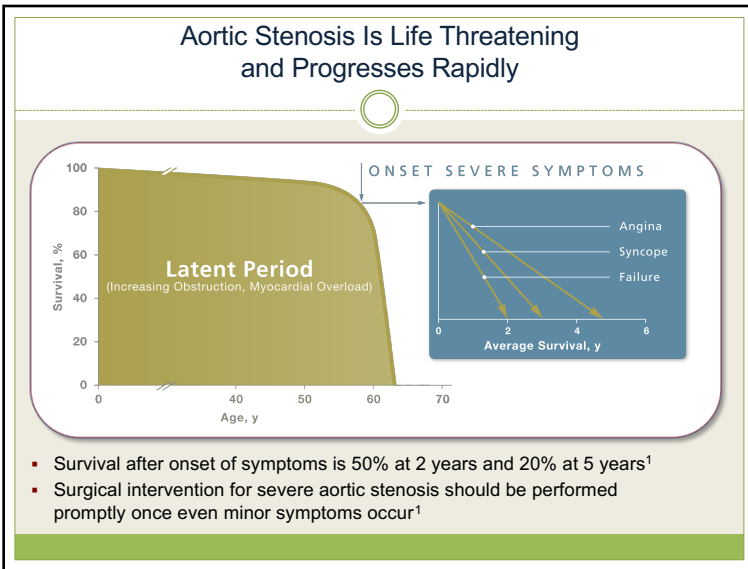
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## Major Risk Factors

Independent clinical factors associated with degenerative aortic valve disease include the following:<sup>4</sup>

- Increasing age
- Male gender
- Hypertension
- Smoking
- Elevated lipoprotein A
- Elevated LDL cholesterol

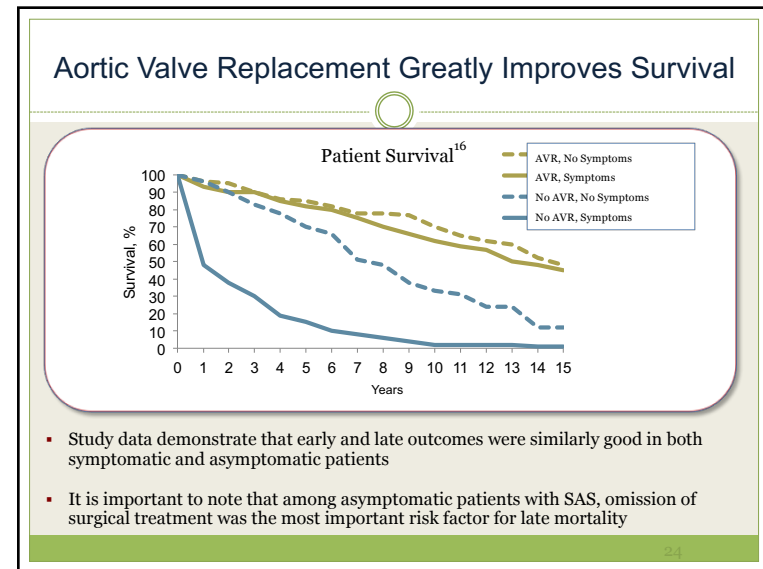
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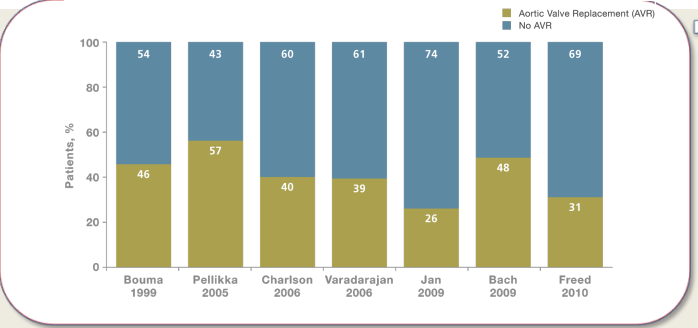
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## Medical Therapy

- Medications such as diuretics may be used if SOB is present
- Unfortunately, there are no medications that can reverse AS
- Though medical research is ongoing, the only definitive therapy is invasive in nature



### Low Percentage of Aortic Valve Surgery



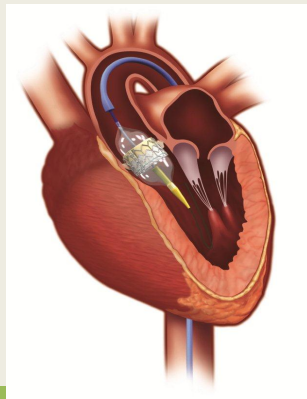
- Studies show at least 40% of patients with severe AS are not treated with an AVR<sup>9-15</sup>

### Aortic Valve Replacement

- Open heart surgery becomes riskier with the older population
- Need for long-hospital stays, rehab, and treatment of co-morbid issues are major factors
- The last ten years has seen a revolution in AS therapy
- TAVR has become a viable technology in the treatment of AS

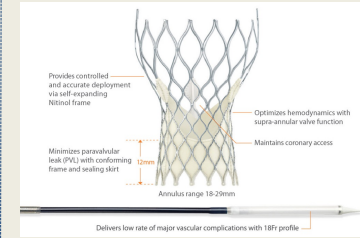
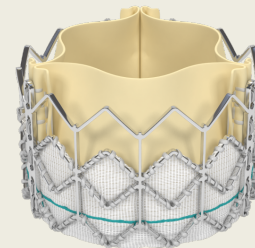
### What is TAVR-Transcatheter Aortic Valve Replacement?

- An aortic valve replacement as an alternative to traditional thoracotomy.
- Less invasive than traditional thoracotomy for patients considered high/intermediate risk for traditional surgery.
- If a cardiac surgeon determines that you are eligible, TAVR may be an alternative. This less invasive procedure allows your aortic valve to be replaced with a new valve while your heart is still beating.



### Two TAVR Options

- Edwards Sapien Valve
- Stainless Steel Frame
- Medtronic CoreValve
- Nitinol Frame-self expanding



## TAVR

- Excellent results from multiple studies for both approved valves
- Corevalve: Recent studies have shown *better* results in high-risk patients receiving a trans-femoral Corevalve as opposed to open heart surgery
- The question of long-term durability is still being examined
- Newer evidence states that TAVR can be performed in the intermediate risk population, not just high-risk
- Low risk trials are underway



## Team Effort

- Only through collaboration with a “Heart Team” can any of these diseases be identified/treated effectively
- At BCH, we now have the ability/team-work to accomplish these goals with the newest technologies
- Physicians, nurses, coordinators, administration all play a vital role
- The ultimate goal is better and more varied options for our patients and our community

Thank You!

