“Valvular Heart Disease”

Valvular Heart Disease explained by:

John R. Hicks, MD, FACC

Board-Certified Cardiologist & Internist

Valvular Heart Disease

Because you have chosen valvular heart disease as a topic to learn about, we suspect that you have been diagnosed with valvular heart disease, or you have a friend or loved one that has been diagnosed with it. It's also possible that you simply have an interest in valvular heart disorders. Whatever the reason, we are very glad that you have chosen to review this topic with us. Valvular heart disease is a group of very common disorders which result in some defect or problem with one or more of the heart valves of the heart. After watching the introduction, here at MDeduonline, we know that you have a basic understanding of how heart valves function. If you do not recall the details of the basic anatomy and physiology the heart valves, this would be a good time to go back and review the introduction to anatomy and physiology of the heart. Otherwise, we will provide a brief review of valvular heart function now.

As a brief and general review, there are a total of 4 heart valves in the hearts of all mammals. There are two right-sided heart valves, and two left-sided heart valves. The right side the heart has the pure function of pumping oxygen-poor blood to the lungs, where oxygen is attached to the red blood cells, and is then sent back to the left side of the heart, which pumps the oxygen-rich blood to the remainder of the body, such as the brain, muscles and vital organs. All heart valves are critical in allowing blood to move forward through the heart, and preventing of leakage of blood backwards." You could say that the entire function of these valves is to keep the blood going in the right direction and preventing any backflow.

The animation shows that the heart valves open during certain phases of the heart-beat, and then close during other phases of the heart-beat. The exact timing and phases of the beat is not that important to understand valve function, but their ability to do their job is IMPORTANT. The valves on the **right side** of the heart are called the **tricuspid and pulmonic** valves. The valves on the **left side** the heart are called the **mitral and aortic valves.** Each valve has its own shape, but generally all valves are extremely thin, very flexible, and when operating normally, open up all of the way, allowing blood to flow freely across the valve. And then they close tightly, so that there is no significant leakage backwards. Valve opening and closing can be likened to either a drawbridge, or the opening and closing of a door.

While all heart valves are important, we will **focus our attention** on the **left-sided heart valves during this presentation.** The reason is that MOST of the time, most patient symptoms, interventional procedures, and surgery for valve problems in adults is caused by heart valve problems on the **left side of the heart**. Again, the valves on the left side of the heart are called the mitral and aortic valves. While

they are both very thin and pliable, these valves are **extremely strong,** as they have to sustain the high pressures on the left side of the heart. And they have to open and close about 100,000 times per day, nearly 1,000,000 times per week, 52 million times per year, and over 2 billion times in a lifetime! That is an amazing amount of work for a structure that is as **thin as a piece of paper.** And to get an idea of how much blood is pumped by the heart through those valves, the heart pumps about 5 quarts of blood *every minute,* which amounts to close to a 1 million barrels of blood during an average lifetime — that's enough to fill more than 3 super tankers!! **These valves are really important!**

Now, we will first begin by talking about structure, function, and diseases or problems of the **aortic valve.** The aortic valve is a **3-leaflet valve** that sits between the main pumping chamber of the heart, also known as the left ventricle, and the aorta. The aorta is the large artery that carries oxygen-rich blood to all of the body. When the main pumping chamber of the heart contracts, the aortic valve opens up all the way, allowing blood to be ejected out of the left ventricle and into the aorta. After the left ventricle has squeezed all of its contents into the aorta, the left ventricle relaxes, then the aortic valve closes, thus preventing the blood that was just ejected out of heart from leaking back into the heart. So, in thinking about this, try to visualize the drawbridge graphic that was shown before. The drawbridge starts out being closed, opens all of the way up, and then closes again. All of this happens in less than one second and as stated above, occurs billions of times in a lifetime.

Now, in thinking about problems with the aortic valve, there are really only 2 different problems that someone can have: a **narrowed** aortic valve, or a **leaky** aortic valve. In reality, people can have BOTH a narrowed and a leaky valve, and in fact, this commonly happens.

A very common aortic valve problem in this country is a narrowed aortic valve. In medical terminology, the Greek word for narrowing is ***stenosis*.** Hence, from this point forward, a narrowed aortic valve will be called a **stenotic aortic valve**, **aortic valve stenosis**, or **just AS.** Aortic valve stenosis is extremely common, and it can have several causes. The aortic valve is a 3-leaflet valve, in other words, it is made up of 3 leaflets (or cusps) that all open and close at the same time. Up to 2% of the population is born with an aortic valve that only has **two leaflets, or 2 cusps.** This is extremely common, and is referred to as a ***bicuspid*** aortic valve. Most people with a bicuspid valve develop a **heart murmur** at some point in their life, which can be detected by a physician using a stethoscope. This may lead to further testing to evaluate the structure and function of the aortic valve, which we will discuss shortly.

As time goes by, usually between the fourth and sixth decades of life, this bicuspid valve can become narrowed or stenotic. This is called **bicuspid aortic valve stenosis.** As stated above, this is extremely common, and in fact, is the most common **congenital heart defect.** If you have been told that

you had a bicuspid aortic valve, you are in good company with Arnold Schwarzenegger, Barbara Walters as well as other celebrities! Another common cause of aortic valve stenosis is **AGING.** Yes, just living long enough can cause aortic valve stenosis. We have found that as people have lived longer lives, calcium can deposit into the thin and pliable leaflets of the aortic valve, making them less pliable, not open well and eventually, these patients can develop narrowing or stenosis of the valve, called **calcific aortic valve stenosis.** It is not unusual for us as cardiologists to see several patients per week in our office with either bicuspid aortic valve stenosis or calcific aortic valve stenosis. In years gone by, **rheumatic fever** was a common cause of aortic valve stenosis, but now, as a result of early recognition and antibiotic therapy, we rarely see rheumatic aortic valve stenosis.

So you've gone to your physician, and you have been told that you have aortic valve stenosis. After getting over the shock, your doctor should go on to tell you whether you have **mild, moderate, or severe aortic valve stenosis.** If not, ask him or her to tell you! This is very important, as ***only patients* that have severe aortic valve stenosis** need to consider undergoing any sort of interventional procedure, such as valve replacement. Your doctor will ask many questions about whether or not you have symptoms. Frequent **symptoms** of aortic valve stenosis include **fatigue, shortness of breath with exertion, chest discomfort, and if severe enough, patients can have episodes of fainting spells, called syncope.** Unfortunately, many of these symptoms can also occur in patients without aortic valve stenosis. So now, you are asking yourself, "Why would I have any symptoms at all with a narrowed heart valve?" This is an excellent question, and will be answered at this time.

As can be seen, when there is narrowing or stenosis of the aortic valve, the left ventricle literally has to "struggle" to eject the blood across the valve into the aorta. This can be thought of with an analogy, utilizing an ordinary door. As you look at a door in the room in which you are now sitting, imagine that the door opens all the way, allowing 5 or 6 people to walk through the door fairly quickly. This would be like the normal opening of a normal aortic valve. If, however, the door is only open a little bit, say 12 inches or so, all people trying to get through that doorway have to struggle. In a similar manner, the left ventricle has to struggle to pump blood across the narrowed aortic valve and into the aorta. Over time, the left ventricle can thicken and even dilate, and the pressures in the heart can become elevated. If the pressures in the left ventricle become very high, this pressure backs up into the lungs, causing **"wet lungs"**, also known as **pulmonary edema,** resulting in significant shortness of breath. As a result of the poor blood flow through the heart, patients can also become very fatigued and tired. If the aortic valve stenosis is bad enough, the patient can actually develop **"congestive heart failure"**, and if extremely severe, the patient can have **fainting spells**, and even **sudden cardiac death.** The main problem with a narrowed aortic valve is *pressure overload* on the left ventricle. If this pressure overload is not released, with some sort of procedure, the heart will continue to fail, the patient will develop

worsening symptoms, and the natural history of untreated aortic valve stenosis, is death. Fortunately, this heart murmur is very easy to hear, and most patients can be diagnosed with aortic valve stenosis *long before* the valve is severely narrowed, assuming they go to the doctor. The great news is that there are several ways to treat aortic valve stenosis, which we will talk about soon. First we will talk about the various ways to diagnose aortic valve stenosis, and ALL valvular heart diseases, for that matter.

In order to properly diagnose valvular heart problems, your physician will begin with the basics, starting with a complete history and physical examination. If you have symptoms to suggest valvular heart disease, or if you have a **heart murmur** during physical examination, your physician is likely order one or more tests to fully evaluate your heart's structure and function. Hold on a minute…what EXACTLY is a cardiac murmur? Simply stated, a **heart murmur** is the **sound** produced by blood tumbling through the heart in a turbulent manner. It is very important that you know that **not all cardiac murmurs are "bad".** In fact, if your doctor listens carefully to the heart sounds of patients, murmurs are frequently heard, and are often harmless, or benign. In the case of aortic valve stenosis, when the blood is being forced across the narrowed valve, a fairly loud and characteristic murmur can be easily heard by your physician.

Now this characteristic heart murmur of aortic valve stenosis, created by the narrowed aortic valve, will prompt your doctor to either refer you to a cardiologist, or possibly refer you for one of the heart tests that is utilized to diagnose aortic stenosis called an **echocardiogram.** An echocardiogram is a very simple, non-invasive **ultrasound of the heart**. It shows us the specific anatomy of the heart structure and function, as well as the structure and function of the cardiac valves. It is extremely useful and the cornerstone of diagnostic tests for evaluating patients with valvular heart disease. You may have had an ultrasound before, of your gallbladder, the arteries in your neck, or perhaps, your child, before he or she was born. This test does not hurt in any way, and in fact is incredibly interesting to watch while it is being performed on you by a specialist called a cardiac sonographer.

After the echocardiogram is performed, the study will be interpreted by a cardiologist, and the report will be sent to your primary care physician for review. It will give all sorts of important information regarding the structure and function of your heart, structure and function of the valves, and if you have aortic valve stenosis, it will give specific information about the possible cause of the aortic valve stenosis and the degree of aortic valve stenosis. This information is extremely important, because it will help guide your therapy. If, for example, the echocardiogram reveals that you have mild or moderate aortic valve stenosis, your doctor will follow you along, see you in the clinic every 3, 6 or 12 months, ask you about your symptoms, and possibly perform repeat echocardiography to reevaluate the aortic valve.

Once the aortic valve is deemed to be severely narrowed *or stenotic, or* if you are having symptoms as a result of the narrowing of the aortic valve, it will be time to discuss treatment options. So let's just imagine you're sitting in your doctor's office and your doctor says "Your aortic valve is severely narrowed, and it is time for it to be replaced". Now, HOW does your doctor know that it is time for your valve to be replaced? THAT IS A GREAT QUESTION. Most of the time, your doctor will make recommendations based upon your particular history, findings on tests, availability of different procedures in your geographic area, and specific guidelines that have been developed to help your doctor manage different heart conditions. In the case of valvular heart disease, guidelines are released every several years to help guide physicians on the management of patient with complex valvular heart problems. The most recent guidelines were released by both the American Heart Association and American College of Cardiology. These guidelines can be found online, and are called: AHA/ACC Guidelines for the Management of Patients with Valvular Heart Disease. This diagram is from such guidelines, is called an algorithm and helps your cardiologist decide when it is time to send you for aortic valve replacement.

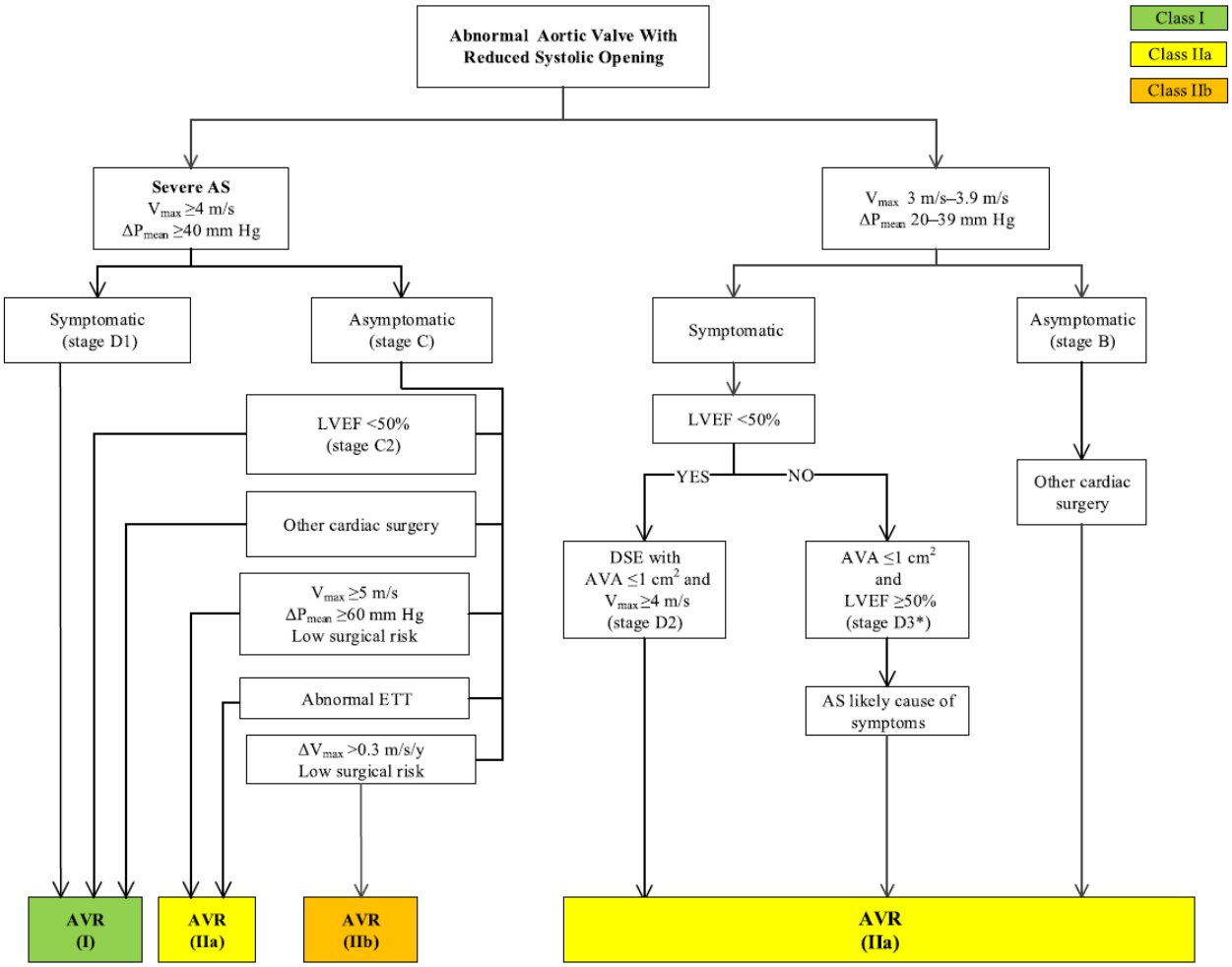

Figure 1. Indications for AVR in Patients With AS

If your aortic valve is not significantly stenotic, and you do not have symptoms to suggest that the aortic valve is causing problems, your cardiologist will follow your aortic valve stenosis for some time. Aortic valve stenosis progresses at different rates, and it is not usually predictable when the aortic valve will become severely stenotic. To keep a close eye on your aortic valve, your primary care physician or cardiologist will recommend serial echocardiograms. Let's say that your aortic valve stenosis has been followed for several years, and now your doctor believes that it is time to "fix" the aortic valve, because it is severely narrowed, and you are having significant symptoms, for example, shortness of breath with exertion, or chest pain.

Your physician or cardiologist now believes that it is time for you to have your aortic valve fixed by some method. This discussion needs to be very thorough, as there are multiple options that you have, and your input counts tremendously. You will be told that you can either have a **mechanical heart valve** or a **biological tissue valve** implanted. You may also be told that there are various ways that this can be accomplished, to include open-heart surgical therapy, called **surgical aortic valve replacement, frequently abbreviated as SAVR**, or a newer, less invasive procedure **called *transcatheter (through the artery in the leg or arm)* aortic valve replacement,** frequently abbreviated as **TAVR or TAVI.** We will begin our discussion with the traditional surgical type of aortic valve replacement, SAVR.

The traditional type of aortic valve replacement involves *surgical* replacement of the diseased aortic valve. As noted before, this is called surgical aortic valve replacement, frequently abbreviated SAVR. This requires admission to the hospital, being taken to the operating room, being put under general anesthesia, and having a median sternotomy, which is when the breast bone is cut. The heart surgeon places the heart on cardiopulmonary bypass, stops the heart with medications, cuts out the bad aortic valve and replaces it with either a mechanical or tissue valve. Obviously, this is surgically invasive, and it requires several days of postoperative recovery. This tried-and-true method of aortic valve replacement has been around for decades and has an extremely good outcome, depending on your overall health. The disadvantages include: a very invasive procedure, the risk of cardiopulmonary bypass, a fairly significant recovery time, and likely, some post-operative pain.

After careful evaluation, if you're heart team does not believe that you are an appropriate candidate for *surgical* aortic valve replacement, or if you qualify for the less invasive procedure, *transcatheter* aortic valve replacement, or **TAVR,** this will be discussed at length with you. This is a **relatively new** procedure, and to date, has **excellent outcomes.** You will be brought to the hospital, and you will undergo cardiac catheterization prior to possible TAVR to confirm the degree of aortic valve disease, as well as to evaluate the arteries feeding the heart for some sort of blockage. If there is

significant blockage of the coronary arteries that coexists with the aortic valve disease, you will either undergo a *staged* procedure of coronary artery stenting *and* TAVR, or it will be recommended that you undergo surgical coronary artery bypass along with surgical aortic valve replacement. Assuming that you only need your aortic valve replaced, you will be considered for TAVR by the cardiac valve team. If this is the case, you will be admitted to the hospital, and a team of experts will pass catheters into your heart from your leg, or possibly your arm, and the physicians will **place a biological aortic valve within your diseased and stenotic aortic valve**, utilize a pressure balloon to open up the biological TAVR aortic valve, removed the balloon, and then remove the catheters. You will be left with be a biological TAVR aortic valve for the rest of your life. And if all goes well, you can expect to be discharged within a day or two.

After your surgical aortic valve replacement or transcatheter aortic valve replacement, for that matter, is successful, you will no longer have an aortic valve that is stenotic, or narrowed. All of those symptoms that were caused by the aortic valve stenosis, particularly shortness of breath, chest pain, and possibly passing out spells, will resolve very quickly, and you will soon begin feeling like yourself again.

As far as choice of which type of aortic valve replacement to have, if undergoing surgical aortic valve replacement, your cardiologist and/or cardiac surgeon will discuss this with you at length. As mentioned earlier, **there are 2 types** of **surgical prosthetic aortic valves: mechanical valves** and **tissue valves.** Mechanical valves are made up of metal and other non-biologic materials, such as pyrolytic carbon. They have the **advantage of being extremely durable,** and last a very long period of time, sometimes up to 30 years. The primary disadvantage of mechanical valves is that they **require chronic blood thinners,** such as warfarin, to prevent the formation of **clots** within the mechanical valve structure itself. Biological valves, typically made from pig heart valves (porcine) or cow heart sac (bovine), on the other hand, **do *not* require blood thinners,** but as of this time, **they do not last quite as long** as mechanical valves. The final decision regarding whether to have a mechanical or tissue valve will be made between you and your cardiologist and cardiac surgeon. If you are **relatively young,** the surgeon will **likely recommend a mechanical valve**, in an effort to avoid a repeat operation later in life. If you are older, or, you cannot take a blood thinner for a long period of time, he or she will likely recommend a biological valve which can last from about 10-20 years, and maybe a lifetime for you. It is the opinion of this author that in the not too-far future, most aortic valve replacement procedures will occur utilizing the transcatheter, nonsurgical techniques.

We have spent a great deal of time discussing a narrowed or stenotic aortic valve; now we will discuss a condition called **aortic valve insufficiency,** also called **aortic valve regurgitation.** Insufficiency

and regurgitation mean the same thing. As described in detail before, aortic valve stenosis occurs when there is a *narrowing* of the valve and blood has a difficult time exiting the left ventricle and entering the aorta. Unlikely that problem, aortic valve insufficiency occurs when there is a **leak in the aortic valve,** usually caused by a process that does not allow the aortic valve leaflets to come together during relaxation of the heart. There are many causes of aortic valve insufficiency including **inflammation, structural and genetic problems with the aortic valve.** Some of the inflammatory causes of aortic valve insufficiency include **rheumatic heart disease, ankylosing spondylitis, rheumatoid arthritis, and LUPUS, also known as SLE.** Structural causes of aortic valve insufficiency include **a bicuspid aortic valve**, **aortic dissection** with resultant aortic valve insufficiency, infection of the aortic **valve,** and actually, a previously stenotic aortic valve. There are **genetic causes** of aortic valve insufficiency which include **Marfan syndrome** and some rare inherited disorders.

Unlike patients with aortic valve stenosis, the major problem in patients with aortic valve insufficiency is that of **volume overload of the left ventricle.** In most patients, aortic valve insufficiency is a chronic and **slowly progressive disease** which results in dilatation and some thickening of the left ventricle itself. Recall that the left ventricle is the main pumping chamber of your heart. Most patients with aortic valve insufficiency have not symptoms for long periods of time until the left ventricle is unable to compensate for the volume overload, or increased workload. Late in the course of the disease, patients develop symptoms of heart failure, such as shortness of breath with exertion, shortness of breath when lying flat, and can develop shortness of breath at night. Some of the symptoms occurring with aortic valve stenosis, such as syncope and chest pain are unusual in aortic valve insufficiency. As in aortic valve stenosis, the abnormal flow across the aortic valve causes a significant murmur, which can usually be heard by your primary care physician or cardiologist. Once this murmur is heard, or if patients have symptoms to suggest a leaky aortic valve, your primary care physician or cardiologist will likely order an echocardiogram.

Once it has been determined that you have aortic valve insufficiency, and depending on the degree of aortic valve insufficiency, your doctor will likely place you on medications to lower your blood pressure, which may reduce how much blood leaks back into the left ventricle. These medicines usually include calcium channel blockers (such as nifedipine and amlodipine), angiotensin-converting enzyme inhibitors (ACE inhibitors like lisinopril, ramipril and enalapril) or angiotensin receptor blockers (ARBs like losartan, valsartan and irbesartan). Unfortunately, while these medications can decrease to some degree the level of aortic valve insufficiency, the disease process usually progresses.

The decision to proceed with repair or replacement of the aortic valve is at times complicated. The decisions are based on the clinical picture of the patient. But there are more things to consider, like the echocardiogram and heart size and function. But once again, guidelines exist to help your cardiologist. In patients who are **symptomatic with severe aortic valve insufficiency**, the decision is clear, and **intervention is almost always recommended.** Sometimes, patients who are asymptomatic but have a dilated and failing hearts, and have severe aortic valve insufficiency, **need to get it fixed despite a lack of symptoms.** Sometimes, patients with severe aortic valve insufficiency who are undergoing heart surgery to have blocked arteries bypassed, undergo aortic valve replacement at the same time to avoid two surgeries. Once again, every situation is unique, and the decision to choose either a mechanical or tissue valve will be based upon a lengthy conversation that you will have with your cardiologist and/or cardiac surgeon and follows the recommendations as discussed previously for aortic valve stenosis. Fortunately, replacement of the aortic valve halts further progression in the level of left ventricular dilatation and most of the time, symptoms are significantly improved or resolve completely.

We will now venture into **mitral valvular heart disease** and its effect on the heart, as well as potential treatment for various mitral valvular heart diseases. The mitral valve is the other important valve on the left side of the heart. As discussed in the anatomy and physiology video, the mitral valve separates the left atrium and left ventricle. Its job is to allow blood to go from the left atrium, into the left ventricle, which then ejects that blood across the aortic valve and to the rest of the body. It is an extremely important valve because it "protects" the lungs from the direct high pressures of the left ventricle. Generally, there are 2 types of mitral valvular disease: **mitral valve stenosis** and **mitral valve regurgitation,** or insufficiency. Again, regurgitation and insufficiency mean the same thing, which is backwards leaking of blood whence it came. While mitral valve stenosis is not seen as a disease as often as it was in the past because of a decrease in the overall incidence of rheumatic fever, this valvular problem is still occasionally seen. Mitral valve regurgitation is nevertheless somewhat common, and it is seen nearly on a daily basis in most cardiologists' practices. But first, we will look at the problem of **mitral valve stenosis,** which is **narrowing** of the mitral valve.

As noted, **rheumatic fever was a major cause of mitral valve stenosis,** but is now becoming a disease of the past in America. Another cause of mitral stenosis is diffuse calcification of the mitral valve, as a result of normal aging in some people predisposed. It's sort of like wrinkles on the face. Some people get more than others. **Mitral valve stenosis,** like aortic valve stenosis is a problem where the **mitral valve is inappropriately narrowed,** or in medical parlance, stenotic. As can be seen in the animation, the mitral valve does not open well, and limits the amount of blood that can be delivered from the left atrium, and into the left ventricle. This results in a **pressure build up on the side of the left atrium**,

which backs-up into the lungs and causes water in the lungs, or pulmonary edema. This causes shortness of breath, especially with exertion. As with other valvular heart diseases, mitral valve stenosis can be diagnosed by physical examination, using a stethoscope, and confirmed by testing, to include, once again, our good friend, echocardiography.

Once your primary care physician or cardiologist suspects that you have mitral valve stenosis, an echocardiogram will be performed. This will clearly show that the mitral valve is not opening well, the left atrium is significantly dilated, and further investigation will confirm that the valve is **mildly, moderately or severely narrowed." Just how bad is important to determine what needs to be done next.**

As a result of the narrowed mitral valve, and subsequent enlargement of the left atrium, patients frequently develop irregular heart-beats called, atrial arrhythmias, commonly atrial fibrillation. **And we have on our MDeduONLINE website a complete talk on these heart rhythm disorders.** Once the patient goes into **atrial fibrillation**, this causes further decrease in blood flow across the mitral valve, and causes the patient to become even more symptomatic with more shortness of breath.

Once a patient has been diagnosed with severe mitral valve stenosis, several therapies are recommended, to include **beta blocker or calcium channel blocker** therapy to slow down the heart rate in atrial fibrillation, as well as warfarin therapy to prevent a clot from forming in the left atrium, which can then dislodge and cause a significant **stroke**.

Ultimately, the definitive therapy for mitral valve stenosis is the same as for aortic valve stenosis, and that is valvular replacement. In the past, there was a procedure called mitral **balloon commissurotomy or valvuloplasty,** which is still **used on occasion.** This is an invasive procedure where a cardiologist passes a deflated balloon across the narrowed mitral valve, inflates the balloon with saline, and "breaks" the valve open so that it is no longer severely stenotic. **This procedure is not definitive,** and usually, the valve becomes narrowed again, in months or years. **Mitral valve replacement** is the most definitive therapy, and similar to aortic valve replacement, can involve either a **mechanical or tissue valve.** The details of mitral valve replacement should be discussed with your cardiologist or your cardiac surgeon.

Mitral valve regurgitation or mitral valve insufficiency is an **extremely common** valvular problem, and can be caused by rheumatic heart disease, coronary artery disease, infection, **mitral valve**

prolapse, calcification of the mitral valve, dilatation of the left ventricle, as well as other causes. So, ask you can see, we have a long list of causes. Mitral valve regurgitation is the **most frequent valvular disease in United States** with nearly 1 in 10 people age 75 or older having moderate or severe mitral valve regurgitation. The fundamental problem in this disorder is that of **leaking of blood from the left ventricle across the mitral valve** back into the left atrium. This creates a **volume overload** condition putting stress on the left atrium and left ventricle. This is different from the pressure overload on the left atrium as seen in mitral stenosis. In mitral regurgitation, the left atrium enlarges, and volume overload progresses as a result of worsening mitral valve regurgitation, and the patient develops shortness of breath, exercise-induced fatigue, and, as in mitral stenosis, atrial fibrillation can occur.

Unfortunately, medical therapy is not that helpful in patients with mitral regurgitation, unless there is significant simultaneous hypertension that is poorly controlled. The definitive therapy for mitral valve regurgitation is either **mitral valve repair** or **mitral valve replacement.** Surgical repair of the mitral valve has come a long way over the past several years, and it is preferred over mitral valve replacement, if the valve is repairable. Some are, and some are not repairable. If you have mitral valve regurgitation, it is important for your cardiologist to determine the cause prior to consideration of any mitral valve intervention, whether repair or replacement. Also, a surgeon with **extensive experience** in the techniques used in **repair of the mitral valve** absolutely necessary to **ensure an excellent result.** And there are regional and local differences in the ability to repair these valves. So do your homework if you have a leaky mitral valve that needs repairing. Once it has been determined that you have severe mitral valve regurgitation, and valve repair or valve replacement is deemed necessary, be sure to have a long discussion with your cardiologist and/or cardiac surgeon as to whether he or she plans a repair or replacement surgery.

There are some new or minimally invasive techniques which can improve the degree of mitral valve regurgitation. One of the newer techniques utilizes what is called a "**MitraClip"®** device. This device is deployed by a catheter, usually from the groin, and results in significant improvement in the degree of mitral valve regurgitation, sometimes from severe to mild, with improvement in symptoms as well as heart size and function. Frequently, after this procedure, surgical mitral valve repair and/or replacement is not necessary.

While there are other valvular heart diseases, particularly, involving the tricuspid and pulmonic valves on the right side of the heart, these tend to be less significant than diseases of the aortic and mitral valves, and hence they will not be discussed here.

That concludes our lesson on aortic and mitral valvular heart diseases. As you have seen, it can be a very complex problem, and if left untreated, can lead to significant problems with symptoms, most commonly shortness of breath, fatigue, congestive heart failure and even death. We trust that you have learned a lot about valvular heart disease from this segment on **MDeduonline.** Please let us know what you think through our contact information, and if you have any further questions. Also, feel free to view our other topics. Thank you for joining us at MDeduonline.