



HEART VALVE SURGERY

A guide for patients

The heart is a pump with four valves that allow blood to flow in one direction only, as shown in the illustration. Each valve must function normally to ensure that enough blood flows to the lungs, the body, and the heart itself.

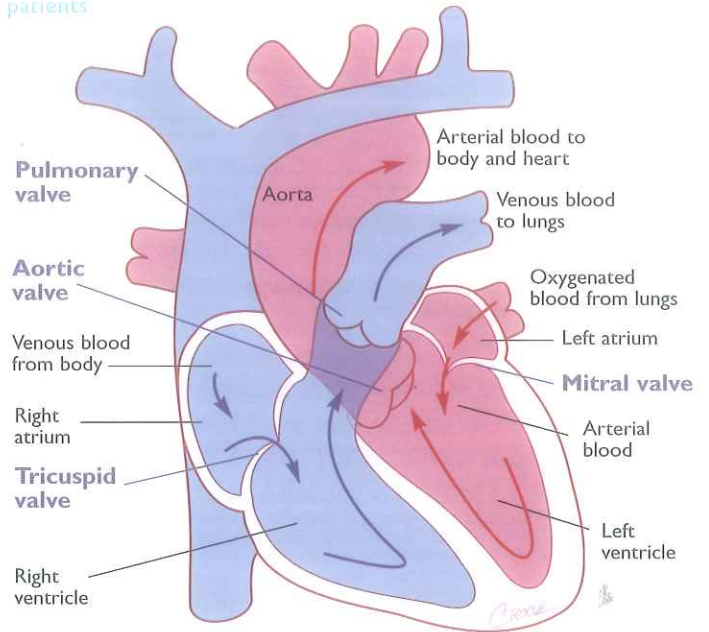
If a valve becomes severely damaged due to disease or the wear-and-tear of old age, it will put strain on the heart. Other organs such as the lungs, brain and kidneys can also be badly affected. People with a malfunctioning valve may need surgery to repair or replace it.

Such procedures have become common. The results of these operations in Australia and New Zealand are among the best in the world.

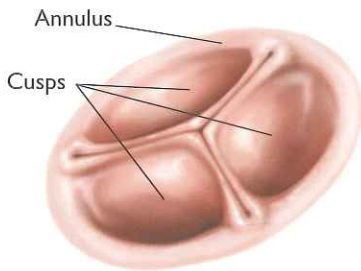
STRUCTURE OF THE AORTIC VALVE AND PULMONARY VALVE

The aortic valve and pulmonary valve are outlet valves. They have three cusps that attach to the corresponding ventricle at what is called an annulus (see illustration below).

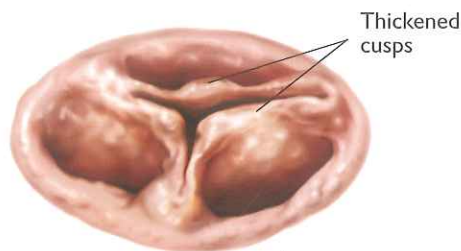
Stretching of the annulus and/or the cusps causes the valve to leak. In some cases, repair is possible. However, more commonly, the cusps are thickened, fused or calcified so much that replacement of the valve is necessary.



Blood is collected from all parts of the body by veins and flows into the right atrium, then through the tricuspid valve into the right ventricle which pumps blood through the pulmonary valve into the lungs. In the lungs, the gases oxygen and carbon dioxide are exchanged between the blood and the air. From the lungs, blood flows into the left atrium, then through the mitral valve into the left ventricle, which pumps it through the aortic valve into the aorta. Blood is then distributed to all parts of the body by the branches of the aorta.



Healthy aortic valve



Diseased aortic valve

TALK TO YOUR HEART SURGEON

This pamphlet is intended to provide you with general information. It is not a substitute for advice from your heart surgeon and does not contain all the known facts about heart valve surgery or every possible side effect.

You are encouraged to fully discuss with your surgeon:

- the type of surgery to be done and why
- its risks, benefits and limitations
- the outcome you can expect.

Read this pamphlet carefully, and save it for reference. Technical terms are used that may require further explanation by your surgeon. Write down any questions, and discuss them with your surgeon. Use this pamphlet only in consultation with your heart surgeon.

IMPORTANT: FILL IN ALL DETAILS ON THE STICKER

DEAR SURGEON: When you discuss this pamphlet with your patient, remove this sticker and put it on the patient's medical history or card. This will remind you and your patient that this pamphlet has been provided. Some surgeons ask their patients to sign the sticker to confirm receipt of the pamphlet.

TREATMENT INFORMATION PAMPHLET

PROCEDURE: _____
 PATIENT'S NAME: _____
 DOCTOR'S NAME: _____
 EDITION NUMBER: _____ DATE: DD / MM / YYYY

YOUR SURGEON



STRUCTURE OF THE MITRAL AND TRICUSPID VALVES

The mitral and tricuspid valves have leaflets that attach to annuli in the inlet part of the ventricles. The leaflets are held in place by strings called chordae that attach to special muscles in the ventricle called papillary muscles. In some cases, repair of abnormalities of the leaflets, annulus and/or chordae is possible. However, a valve with severe degeneration, thickening, destruction or calcification of the leaflets must be replaced.

TYPES OF ARTIFICIAL VALVE

If a diseased heart valve cannot be repaired, your surgeon can replace it with an artificial valve that is either mechanical or bioprosthetic. Discuss with your surgeon the attributes of each, and which device best suits your needs.

Mechanical valves

These are made of durable synthetic materials and can last a lifetime. However, life-long anticoagulation with warfarin is needed to reduce the risk of blood clots. These valves are associated with a slight ticking noise related to valve closure. It is usually only noticeable in a quiet room, and in many patients is not noticeable at all.

Bioprosthetic or tissue valves

These are heart valves taken from animals or human donors. The tissue has been treated to reduce the risk of rejection. Bioprosthetic valves have a limited lifespan that is dependent on the patient's age and other factors. Warfarin anticoagulation may not be necessary.

THE ROSS PROCEDURE

In certain patients (generally younger than 50 years), the aortic valve can be replaced with the patient's own pulmonary valve. The pulmonary valve is then replaced with a bioprosthetic valve. The advantage is that life-long anticoagulation with warfarin is not needed.

HEART VALVE DISEASE

The aortic and mitral valves are most commonly affected because they are subjected to high pressure in the left ventricle. The tricuspid and pulmonary valves, which work in the low-pressure right side of the heart, are less commonly involved.

Two types of problem may affect heart valves: stenosis and regurgitation.

- "Stenosis" means a narrowing or a stiffness of the valve that restricts blood flow through it. Aortic-valve stenosis makes the heart work harder, so it becomes thickened (hypertrophied). This thickening of the left ventricle may lead to permanent damage if the valve is not corrected. In mitral valve stenosis, the left ventricle does not fill properly, and blood backs up into the lungs.
- "Regurgitation" (also called insuffi-

ciency, incompetence or leakage) is due to failure of the valve to close properly, which allows blood to flow backwards. This means that the ventricle has to pump much more blood with each beat. This eventually causes the ventricle to enlarge or dilate, so that the muscle becomes stretched and thickened. Once the heart becomes over-stretched, recovery of normal function is less likely, even after the valve is repaired or replaced.

SYMPTOMS

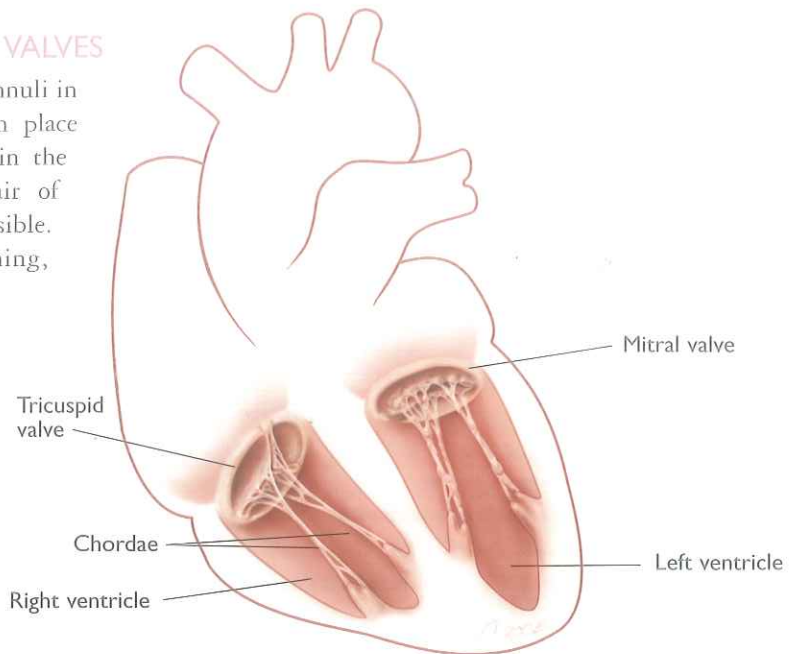
Symptoms due to aortic valve stenosis occur when the left ventricle:

- can no longer pump enough blood through the narrowed valve, causing light headedness or black outs
 - becomes so thick that its demand for oxygen exceeds its blood supply, causing pain like angina.
- In aortic-valve regurgitation, symp-

toms may only occur after heart dilatation has become severe. The main symptom is shortness of breath.

For a long time, the heart can compensate for a faulty valve. The appearance of symptoms means that the heart's compensating mechanisms are no longer sufficient, and the heart is starting to fail. Therefore, symptoms can happen quite late in the course of development of valve disease.

Anyone with evidence of valve disease, even if without symptoms, should have tests to determine the degree of valve malfunction and its effects on the heart. This is done primarily by clinical examination, echocardiography, ECG and chest X-ray examination. The aim is to determine the best time to operate, preferably before the effects on the heart have become irreversible.



Bi-leaflet mechanical valve



Single occluder mechanical valve



Tissue valve



Non-stented tissue valve



CAUSES OF VALVE DISEASE

Heart valve disease may be caused by:

- stretching of the valve due to weakness of its tissue
- abnormality of the valve and chordae, which can cause regurgitation
- a build-up of calcium on the valve, often due to age or structural abnormal-

ity of the valve

- a congenital defect (for example, one person in every 400 is born with an aortic valve that has two leaflets, instead of the normal three)
- bacterial endocarditis, an infection of the inner lining of the heart, including the valves

- rheumatic fever, an immune response triggered by streptococcal bacteria, which can damage the heart valves and heart muscle
- coronary artery disease and heart attack, which can affect the papillary muscles.

DECIDING TO HAVE SURGERY

The decision to have surgery should only be made after discussion with your cardiologist and heart surgeon. The decision is yours and should not be made in a hurry. Make the decision only when you are satisfied with the information you have received and believe you have been well informed. Your surgeon cannot guarantee that the surgery will meet all of your expectations or that the surgery is without risk.

Expectations: Patients should have realistic expectations about what heart valve surgery can achieve. Not everyone will get the same results.

Consent form: If you decide to have surgery, your surgeon will ask you to sign a consent form. Read it carefully. If you have any questions, clarify these with your surgeon.

Costs of Surgery: Your surgeon can advise you about coverage by public and private health insurance, and out-of-pocket costs. You may want to ask for an estimate. This includes medical and hospital fees, and other items. As the actual surgery may differ from the proposed surgery, the final account may vary from the estimate. It is better to discuss costs with your surgeon before surgery rather than afterwards.

BEFORE SURGERY

To plan the best treatment, your surgeon needs to know your medical history. Fully disclose health problems you have had. Some may interfere with surgery, anaesthesia or aftercare. Tell your

surgeon and the nurse (on admission to hospital) if you have had:

- an allergy or bad reaction to antibiotics, anaesthetics or other medicines
- allergy to surgical tapes or dressings
- prolonged bleeding or excessive bruising when injured
- problems with blood clots in the lungs or deep veins of the legs (DVT)
- recent or long-term illness
- any problems with your teeth, such as tooth abscess
- psychological or psychiatric illness
- poor healing or bad scar formation after surgery
- a stomach or duodenal ulcer.

Medicines: Give the surgeon a list of ALL medicines you are taking or have recently taken, including medicines prescribed by your family doctor and those bought without prescription, including vitamins and herbal therapies. Include medicines taken for long-term treatments, such as insulin, warfarin or contraceptive pills.

In particular, tell your surgeon if you are taking medicines that increase the risk of bleeding, such as:

- aspirin and medicines containing aspirin (such as some cough syrups)
- blood thinning injection (such as Clexane and Fragmin)
- anti-inflammatory medicines (often used to treat arthritis)
- antiplatelet drugs other than aspirin (such as Plavix, Persantin and Asasantin, Iscover and Ticlid)
- large doses of vitamin E.

These are often withheld before surgery, but they may be a part of your management, so cessation of some of them may not be advisable. Your surgeon will advise you of their use prior to your operation. Discuss this carefully with your surgeon. Antibiotics or small doses of blood-thinning agents may be prescribed prior to surgery. Feel free to ask your surgeon any questions about medications.

Smoking: Smoking damages the lungs and reduces lung function. Smoking increases surgical and anaesthetic risk, and impairs healing. It should be stopped for as long as possible before surgery. Smokers who do not quit should not expect to have good long-term results from heart valve surgery.

Sources of infection: Abnormal or diseased heart valves and artificial valves are prone to infection. Therefore, it is important that potential sources of infection (such as dental infection and skin ulcers) are treated and healed before valve surgery. Have a dental check-up before surgery. To protect your valve, you must have antibiotic cover, which can be prescribed by your cardiologist, surgeon or local doctor.

Anaesthesia: Heart valve surgery is performed under general anaesthesia. Anaesthetic drugs are safe with few risks, but some people have reactions to them. If you have had a reaction to an anaesthetic drug or any other drug, tell your anaesthetist or surgeon. Your anaesthetist will explain more about the anaesthetic best for you.

Interpreter Service

If you have trouble reading English, telephone the translating and interpreting service.

Australia: Translating and Interpreting Service (T.I.S.) 13 14 50 (national number).

New Zealand: Interpreting and Translation Services 09 276 0014 (Auckland).

Mehe raruraru ana koe ki te riiti i nga korero-pukapuka i roto i te reo Paakeha, me waea atu koe ki te tari kai whakamaori i nga kupu korero pukapuka me te reo, Te naama hei waea - tangaatu mou i Ahitireiria (Australia) ko: 13 14 50. Te naama waea i Aotearoa (New Zealand) ko: 09 276 0014.

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VIETNAMESE
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GREEK

Se avete difficoltà nel leggere in inglese, telefonate al servizio interpreti e traduttori. Australia: 13 14 50 Nuova Zelanda: 09 276 0014

İngilizce okumakta zorluk çekiyorsanız, tercümanlık servisini arayınız. Avustralya: 13 14 50 Yeni Zelanda: 09 276 0014

إذا وجدتم صعوبة في قراءة الإنجليزية اتصلوا بخدمة الترجمة الخطية والشفوية على الرقم 13 14 50 في أستراليا و 09 276 0014 في نيوزيلندا

Afai e faaletonu lau faitau i le Gagana Peretania, telefoni le tautua faaliliu ma faamatala upu. Ausetalia 13 14 50 Niu Sila 09 276 0014

TONGAN
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Αν δυσκολεύεστε να διαβάσετε αγγλικά, τηλεφωνήστε στην υπηρεσία διερμηνέων μεταφραστών. Αυστραλία: 13 14 50 Νέα Ζηλανδία: 09 276 0014

Nếu quý vị gặp khó khăn khi đọc tiếng Anh, điện thoại cho dịch vụ thông ngôn và phiên dịch. Tại Úc: 13 14 50 tại Tân Tây Lan: 09 276 0014.

如果您閱讀英語有困難，請致電口筆譯服務處。澳大利亞：13 14 50 新西蘭：09 276 0014

Kapau 'oku 'ikai ke mahino ho'o lau he lea fakapapalangi, telefoni ki he kautaha liliulea mo fakatonulea. 'Aositelelia: 13 14 50 Nu'usila: 09 276 0014

Surgery to replace a heart valve

The breastbone (sternum) is cut, and the chest is opened. Soft tissues in front of the heart are parted, and the membrane surrounding the heart (pericardium) is opened.

The heart is stopped, and a heart-lung machine takes over the pumping of blood to the brain and other organs; this is called cardiopulmonary bypass. The diseased valve is exposed through an incision in the heart or aorta. It is then partly or completely removed, and the artificial valve is sewn into its place. The incision in the heart or aorta is closed.

The surgeon then restarts the heart so it resumes its normal rhythm. All air is removed from the heart, and then heart-lung machine support is withdrawn.

The surgeon checks that the valve is functioning correctly and that the output of blood by the heart is normal. Any bleeding is stopped. Tubes are placed within the chest to drain the blood and fluid that collect after surgery. Pacing wires are placed on the heart, and the ends are brought through the skin. They are needed in case the rhythm needs to be corrected, or the rate needs to be controlled; in several days, they will be gently removed.

The breastbone is closed, typically with stainless steel wire that is left in place, and the skin is closed with hidden sutures. Heart valve surgery usually takes from three to six hours.

Minimally invasive heart valve surgery

The surgeon may be able to replace the aortic or mitral valve through a smaller incision. The aortic valve may be repaired or replaced through a 10 to 15-centimetre incision in the breastbone. The mitral valve may be repaired or replaced through a small incision in the left or right side between the ribs.

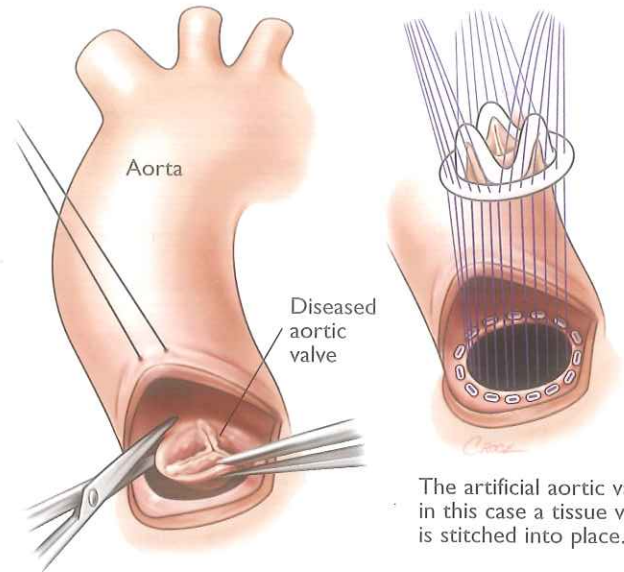
In some cases, minimally invasive surgery may have the advantages of faster recovery and a slightly shorter hospital stay. However, this surgery is undertaken only in certain patients.

During minimally invasive valve replacement or repair, cardiopulmonary bypass is sometimes undertaken using veins in the neck and groin, and the femoral artery in the groin.

Trans-catheter Aortic Valve Implantation (TAVI)

TAVI is under evaluation for elderly patients, where conventional surgery is deemed to have too high a risk. TAVI involves inserting a pericardial tissue valve into the heart and expanding it in the aortic valve position, without excising the aortic valve. This can be done either by a percutaneous technique (via the femoral artery in the groin) or via a small opening in the chest, under the left breast region (trans-apical) approach. These

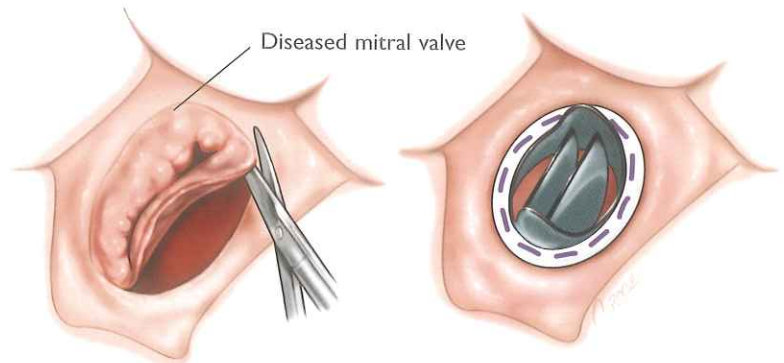
AORTIC VALVE REPLACEMENT WITH A TISSUE VALVE



The surgeon opens the aorta and removes the aortic valve.

The artificial aortic valve, in this case a tissue valve, is stitched into place.

MITRAL VALVE REPLACEMENT WITH A MECHANICAL VALVE



The surgeon opens the heart and removes the mitral valve.

The artificial mitral valve, in this case a mechanical valve, is stitched into place.

techniques are being used as part of a clinical trial and have not been fully approved for their insertion by the Therapeutics Goods Administration. Clinical trials are ongoing.

Surgery to repair a heart valve

Instead of replacing a diseased heart valve, the surgeon may be able to repair it. The repair is performed only if the surgeon believes the procedure is likely to restore acceptable, long-term function. This applies more often to the mitral and tricuspid valves than to the aortic valve.

As shown in the illustrations on page 5, the mitral valve may be repaired by:

- tightening the annulus, usually by insertion of a ring or band (annuloplasty), as shown in the illustration (right)
- modifying the leaflets by removal of excess tissue, as shown in the illustration (left)

- shortening or replacing the chordae ("heart strings").

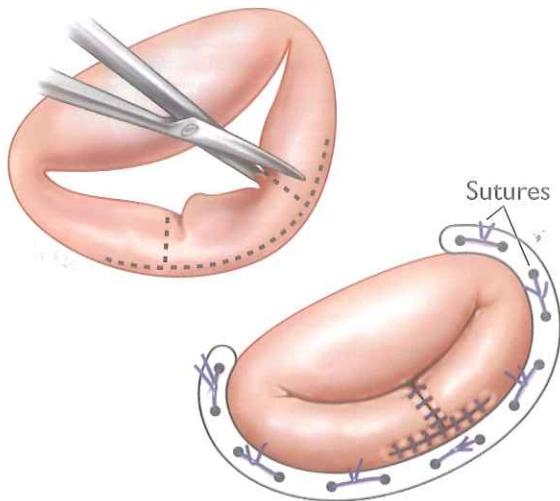
The tricuspid valve may be repaired by tightening the annulus. Procedures on the leaflets or chordae are uncommon.

The aortic valve may be repaired by:

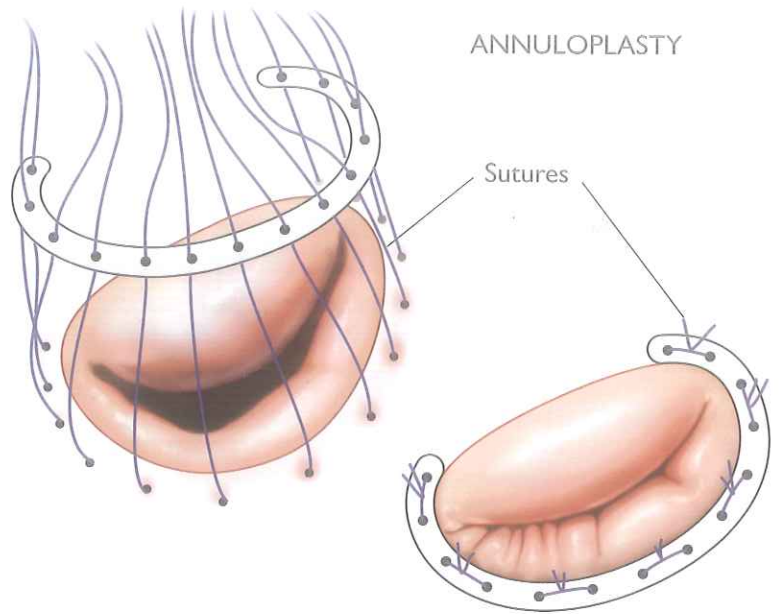
- splitting the cusps where they have fused
- modifying the annulus or attachment of the cusps; this can be done if the cusps are not diseased.

Replacement of a heart valve: If a valve cannot be repaired, it has to be removed and then replaced with a valve of the appropriate size, as described above.

MITRAL VALVE REPAIR BY QUADRANGULAR RESECTION



The surgeon removes a section of excess tissue from the leaflet and uses sutures to repair it. An implanted ring (or band) is used to reduce the size of the annulus.



The implanted ring or band reduces the enlarged annulus and allows the valve leaflets to close completely.

Recovery from heart valve surgery

After surgery, you are cared for in an intensive care unit for the first 24 to 48 hours. As you recover, you are transferred to a ward and attended by specially trained nurses and physiotherapists until you are ready for discharge.

Your physiotherapist will start you on a simple exercise program, including deep breathing exercises and coughing. Coughing and exercise reduce the risk of pneumonia and improve your circulation.

Drainage tubes in the chest are removed in one to two days. You are discharged from hospital when your

surgeon is satisfied with your progress.

Most people need about three months to recover completely. Those who work in non-physical jobs may be able to return to work in six to 12 weeks. To help your recovery, gradually increase your activity. Most patients are encouraged to join a rehabilitation exercise program. Do not lift heavy weights (including small children) or drive until approved by your doctor.

After heart valve surgery, patients report a variety of problems that usually resolve, such as tiredness, blurred vision, nausea, poor appetite, poor concentra-

tion, memory loss, constipation or sleep disturbances.

There have been significant advances in pain relief after heart valve surgery in recent years, and a variety of methods are available. Discuss this with your anaesthetist. After the first few days, tablets (such as paracetamol and codeine) are usually sufficient.

To improve your health and well being, it is important to eat healthy foods, lose excess weight, exercise regularly (under your doctor's supervision), and do not smoke.

Anticoagulant or “blood thinning” drugs

Anticoagulant drugs reduce the risk of blood clots forming on the surface of a mechanical or tissue valve, and prevent a mechanical valve from sticking or jamming.

The most commonly used anticoagulant is warfarin (Coumadin), which is taken orally once a day. Initially, the dose is adjusted every second day based on the result of a blood test to measure clotting time and the level of anticoagulation (called the INR). Once the correct dose is established, the test is done weekly and finally monthly. The dose varies

from person to person and may vary in the same person, often depending on diet.

Patients with a mechanical valve have to take warfarin permanently. Those with a tissue valve may be able to stop taking warfarin in six to 12 weeks.

The main side effect of warfarin is bleeding, which can be life threatening. This is unlikely to occur if the correct dose is taken and the INR is tested regularly. Wear a medical alert bracelet stating that you are taking anticoagulant medication. To determine a patient's

INR, testing kits are available. They must be used under close medical supervision and are not suitable for everyone.

Notify your doctor immediately if you have any of these symptoms:

- bleeding from a cut or wound that does not stop by itself
- nosebleeds
- bleeding gums from brushing
- red or black, tarry stools
- blood-stained urine
- any unusual symptoms such as pain, swelling or discomfort.



POSSIBLE COMPLICATIONS OF HEART VALVE SURGERY

As with all surgical procedures, heart valve surgery does have risks, despite the highest standards of practice. While your surgeon makes every attempt to minimise risks, complications can occur, and some may have permanent effects.

It is not feasible for a surgeon to outline every possible or rare complication of the operation. However, it is important you have enough information to fully weigh up the benefits, risks and limitations of surgery. Most patients will not have a complication, but if you have concerns about possible side effects, discuss them with your surgeon. The surgical risks of death and serious complications increase with age, other significant illnesses, heart damage, urgency of operation, the need for other heart surgery (such as coronary artery bypass grafting) and recurrent surgery.

The following possible complications are listed for your information. There may be others that are not listed. You may wish to discuss the frequency and consequences of these complications with your surgeon.

EARLY RISKS AFTER SURGERY

Mortality: For an otherwise healthy person under 70 years of age, the risk of dying during or after heart valve surgery is about one to two in every 100 procedures. However, in the case of a badly malfunctioning valve, a decision NOT to have the surgery will carry a much higher risk of serious debility and early death.

Stroke: Although stroke is uncommon, the risk increases with age and disease of the aorta. The effects of stroke may be temporary and resolve over a few days, or may be permanent and include:

- loss of feeling in a part of the body
- paralysis of one side of the body or an arm or leg (may be complete or partial)
- speech difficulty
- visual disturbances.

Cognitive dysfunction: About one patient in three may have some difficulty with concentration or blurred vision after valve surgery. This may last for three to four weeks. A permanent effect on concentration or vision is unlikely.

Bleeding: About three patients in 100 may need further surgery to control bleeding.

Arrhythmia (irregular heart beats): The most common arrhythmia in the first postoperative week is atrial fibrillation, which can affect up to one in three patients. It is usually treated with medication. Occasional extra beats are common and not a cause for concern. Uncommonly, a serious

irregular rhythm can occur and may require an electrical shock to correct. In rare cases, a permanent pacemaker may have to be implanted to control the heart rate. If you feel palpitations after you go home, tell your cardiologist. If palpitations do not subside after a few minutes or if you feel unwell or dizzy, call an ambulance.

Non-healing of the breastbone: Uncommonly, the bone may not heal normally. This is more likely following protracted coughing after surgery. In some cases, the wire sutures may pull out. Surgery to repair the bone may be necessary. This complication can also be caused by infection of the breastbone.

Infection of the breastbone: Treatment of infection of the breastbone usually requires re-hospitalisation, prolonged administration of antibiotics and often surgery.

Scarring: Most incisions heal well, but a few people develop raised or widened scars. Infection in the wound or areas of movement increases the risk of adverse scarring.

Blood clots: A clot may form in a deep vein, most often in the leg or thigh (deep venous thrombosis, or DVT). DVT requires immediate treatment and can be life threatening in some cases.

Areas of collapsed lung: These typically respond to physiotherapy.

Chest wall pain: This usually resolves by four to six weeks after the surgery.

Kidney failure: In those patients with previously normal kidney function, this is a rare complication.

Mood swings: It is common for patients to have some anxiety and loss of confidence related to their heart and general health, but this usually improves during the weeks following surgery.

Other risks: Although uncommon, numerous other risks of heart valve surgery exist, including:

- respiratory failure and the need for a tracheostomy
- blood infection
- accumulation of fluid around the heart and in lung cavities that may require further drainage
- accumulation of air in the chest (pneumothorax) requiring temporary tube drainage.

LATE RISKS AFTER SURGERY

Bacterial endocarditis: The heart chambers and valves are covered with a membrane called the endocardium. As mentioned on page 3 ("Sources of

infection"), patients with a diseased heart valve or an artificial valve are at risk of an infection developing on the valve. This is called infective endocarditis and is a very serious condition. Therefore, to reduce the likelihood of it happening, it is important that, for the rest of your life, you take prophylactic antibiotics before all dental or surgical procedures, no matter how minor, including endoscopy or removal of a skin lesion. If you have an artificial valve, always tell your dentist and other doctors so they can take appropriate precautions.

Valve failure: Rarely, a mechanical valve malfunctions, requiring urgent surgery to replace it. If a tissue valve fails, it does so more slowly and progressively.

Peri-valvular leak: Rarely, a small leak can develop between the valve prosthesis and where the valve has been sewn in. In some cases, further surgery may be needed to correct the problem.

Haemolysis: This rare problem causes anaemia and occasionally mild jaundice. It is more likely to occur if the complication of peri-valvular leak develops late after heart valve surgery.

REPORT TO YOUR SURGEON OR CARDIOLOGIST

Contact your surgeon or cardiologist at once if you develop any of the following:

- fever (more than 38°C) or chills
- night sweats
- loss of appetite
- joint pains
- bleeding from the surgical area
- blood in urine, or dark or black stools
- a wound that drains for more than a day
- increasing pain or redness of a wound
- severe headache
- sudden breathlessness
- persistent or frequent palpitations
- dizziness or blackouts
- eye symptoms, such as loss of vision or spots in front of your eyes
- weakness in any part of your body or slurring of speech
- any other concerns you may have about the surgery.

If you cannot contact your heart surgeon or cardiologist, go to your family doctor or Accident and Emergency at your nearest hospital.