

New Parts for Old

Dr Grace Higgins

Quality of Life

- Wigs
- Dental implants & false teeth
- Cochlear implants
- Joint replacements
- Breast implants
- Penile implants
- Contact lens, glass eyes
- Artificial limbs
- False nails

Duration of Life

- Pacemaker
- Stents in coronary or other arteries
- Artificial heart valves
- Defibrillators
- Heart-lung (bypass) machine
- Life support machines - Respirator, Ventilator
- Renal dialysis machine

No bionic device would be developed without cooperation at many levels:

- Funding bodies which support scientists, in other words, usually the general public
- The inventor of the device, who take out patents
- Trials, often involving animals - Animal Ethics Committees
- Therapeutic Goods Administration - the “watch dog” in Australia
- Clinical trials - Human Ethics Committees
- Peer review

Man-made systems have obvious limitations, which include:-

1. Biocompatibility
2. Fixation and attachment
3. Signal acquisition and delivery
4. Energy conversion and transmission
5. Computation and control

Before using any bionic device these questions must be addressed for each case:-

- (a) Is it safe?
- (b) Is it effective?
- (c) Is it worthwhile?
- (d) Will it work for the person's life span?
- (e) Is it forgettable?
- (f) Is it low maintenance?

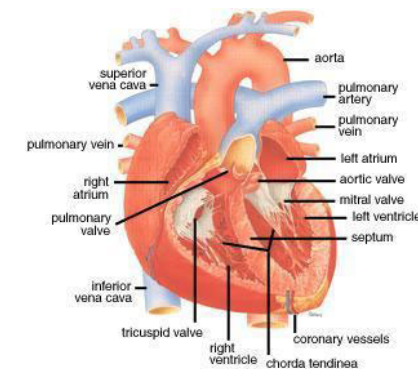
Problems with the host may include:-

- Thrombosis
- Alterations in cellular elements or plasma proteins
- Adverse immune response
- Damage to adjacent tissue
- Predisposition to cancer
- Toxic or allergic response

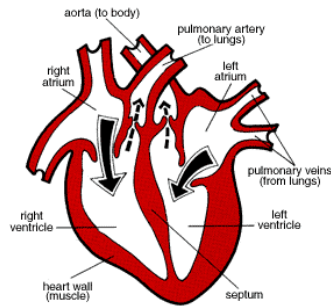
Problems with the device may include:-

- Degradation
- Corrosion
- Swelling or softening

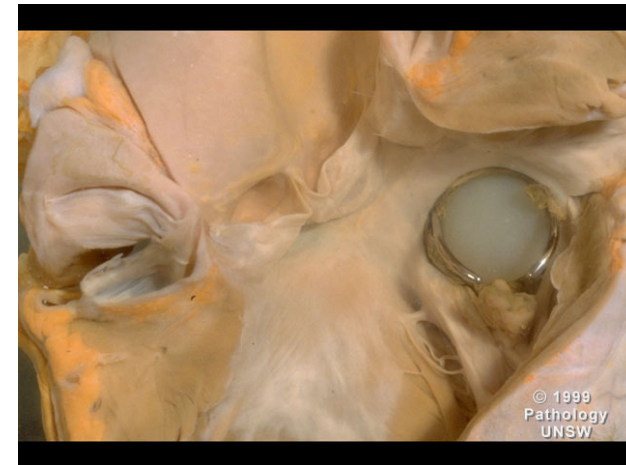
Cross Section of the Heart



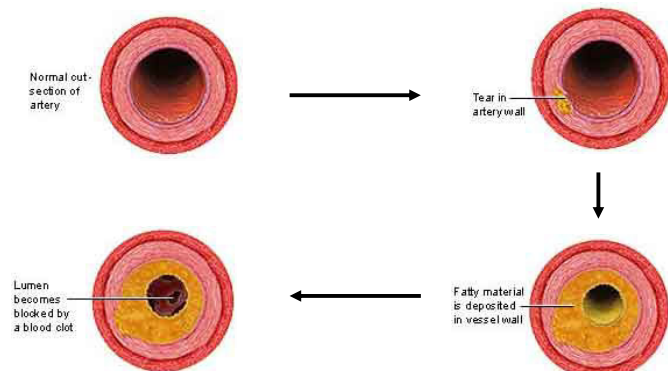
Blood Flow Through the Heart



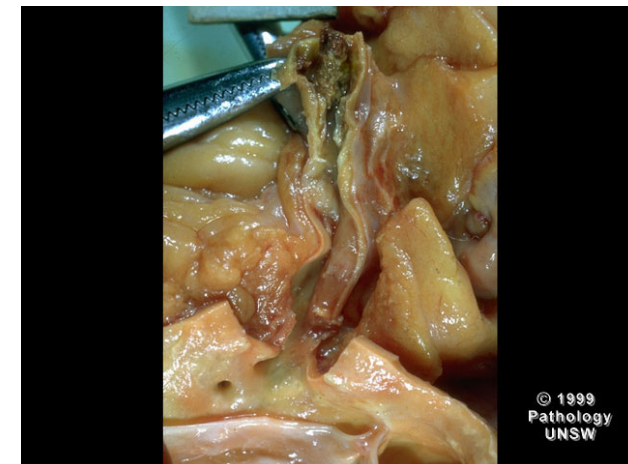
Prosthetic Mitral Valve with Attached Thrombus



Progression of Atherosclerosis



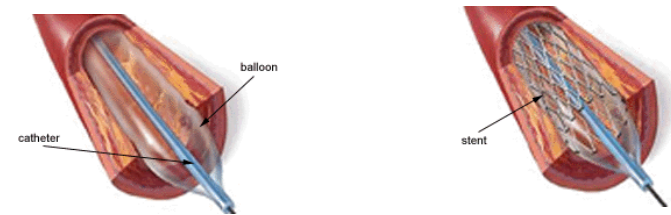
Coronary Artery Atheroma



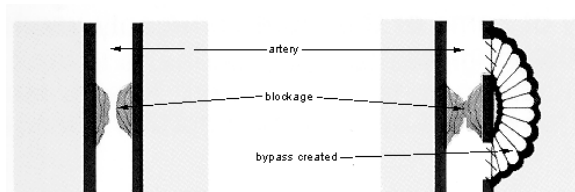
Recanalised Coronary Artery Thrombus



Balloon Angioplasty and Stent



Coronary Artery Bypass



Bypass of Blocked Artery.

Chest X-ray Showing Pacemaker



Pacemakers



Generational changes in pacemakers, from early (left) to recent (right)