Bioabsorable material

The use of bioabsorbable polymers in the manufacture of implants for soft tissue fixation has been clinically accepted for many years.

Bioabsorbable versus Metal

Bioabsorbable implants have many advantages over metal implants, including:

1. Load sharing versus stress shielding
2. Reduced risk of articular damage
3. MRI compatible for Post-Op diagnosis
4. Minimised risk of obstruction during revision surgery if required
5. Minimised risk of stress risers normally associated with implant removal.

Bioabsorbable polymers are a special class of plastic materials that allow the material to serve a function, and then gradually break down, metabolise and be eliminated from the body.

It is imperative to match the degradation time with the initial period during which the material must function.

The ideal bioabsorbable material will provide appropriate strength while degrading in a predictable fashion without adverse reactions occurring in the body throughout the healing process. Specific Bioabsorbable Polymers

There are three main types of bioabsorbable polymers used in orthopedics:

1. PGA: although highly crystalline, PGA absorbs very quickly into the body, losing virtually all strength within 1 month and all mass within about 6 to 12 months. During this phase of rapid absorption, large quantities of a glycolic acid monomer are released, potentially causing clinical complications within a few months following implantation.
2. PLLA: Poly (L) Lactic Acid has a much slower rate of absorption than PGA. The L (Levo) version of this polymer is highly crystalline due to the ordered pattern of the monomers, (i.e. L-L-L-L-L- L-L) and has been documented to take as much as 5-7 years to absorb.
3. PDLA: the D (Dexo) Isomeric form of PLA, has a much faster absorption rate.
4. PDLA: is a racemic mix (equal amounts of left and right - handed isomers) of Poly-Levo-Lactic Acid and Poly-Dexo-Lactic Acid. This polymer is sometimes called 50:50 PDLA in the field.

Copolymers

Bioabsorbable polymers are often blended into a copolymer to maximise initial strength and increase the rate of absorption. Typical blends are:

- LLA/PGA: normally 80/20, this copolymer holds its mechanical strength for 6-8 weeks and is fully resorbed in approximately one year. This material is predominantly used in paediatrics. Because of the need for rapid resorption during a child's development.
- L/D PLA: 9H/4D and other blends, such as 80:20 or 70:30, are available depending on the clinical requirements for initial strength versus rate of resorption. 96 U4D copolymer combines the initial strength of PLLA with a foster resorption time compared to 100% PLLA.

Self-Reinforced PLA

There are many ways of manufacturing bioabsorbable polymers, including compression moulding, casting, injection moulding and extrusion.

An extruded bar is heated until soft and pulled through a dye in a controlled manner. This aligns the polymer chains in the direction of pulling and also entangles them to form the Self-Reinforced polymer.

This Self-Reinforced polymer has high initial strength that reduces premature fracture during implant insertion. It also allows the implant to maintain holding power throughout the healing process.

As with all bioabsorbable implants, they biologically resorb over time, allowing the load to transfer to the bone after primary bone healing and eventually completely disappear through safe biological resorption

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