SUMMARY

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The orthopaedic surgeon has historically been required to make knowledgeable choices from a growing list of biomaterials available for use in prosthetic applications.

The essence of clinically applied materials science is to help provide information suggesting which of the biomaterials is more appropriate for particular applications.

As mentioned, some of the desirable properties of orthopaedic biomaterials include strength, hardness, ductility, modulus, biological response, and use with or without cement.

Each material possesses a different biomechanical profile and some general conclusions may be made as to the choices of biomaterials in specific situations. So, we must know the current thinking regarding the most appropriate choices of biomaterials in orthopaedic use.

The use of orthopaedic implants is growing rapidly in terms of both number and sophistication. As knew designs move through development and into clinical use, problems arise with the utilization of traditional biomaterials in new roles, and new biomaterials are required to achieve the desired therapeutic goals.

A wide range of new orthopaedic biomaterials and processes, inducing bioactive loadings, wear-resistant surface modifications, modified bone cements, and composite and reasonable materials have been under investigations and we should know about them. As orthopaedic surgery is exciting and promising, new technological developments, the practical and clinical

observations of these renewing materials and selection of devices and therapeutic approach best suited to each individual patient.

The choice of biomaterial for each individual patient have suggested that certain biomaterials are more appropriate for particular applications which are grouped according to the anatomical location and the type of application.

The strength, modulus, hardness, biologic response and cementation are not playing an important role in the choice of materials in specific situations, specific designs and replacement of one material with another. Also, the flexibility of prosthesis depends on both material and geometric properties.

As regard to the local effects of biomaterials:

We must incorporate methods to decrease the peri-prosthetic particulate burden, to decrease its local effects, like osteolysis.

As regard metallic, polyethylene wear debris:

By new design techniques on the use of ceramics as a mean to decrease UHMWP wear. Pre-treatment of polyethylene as by heat and pressure, which has been introduced in the hope to improve the performance of polyethylene and the mechanical properties.

Metallic wear is also being under improvement by nitrogen ion implantation, which have been introduced to decrease the potential for abrasive wear and fretting in titanium alloy stems.

Polishing of the stem decreases particle generation from stem-bone fretting.

In addition, polishing minimizes silicate contamination. Furthermore, improvement of the designs will improve the manufacturing tolerance and metallurgical processing in order to minimize the prevalence and severity of the mechanical assisted cervice-corrosion process.

As regard to implant fixation:

Implant fixation is an important variable. As, it is believed that circumfrential, more extensive porous coatings will improve fixation as well as reduce the likelihood of transport of UHMWP particles to distal portion of the femoral canal in total hip arthroplasties.

Also, good implant fixation reduces the different types of corrosion that may result, and lead to wear accumulation and hence it's local complications.

As regard systemic and remote site-effects:

It is important to recognize the role of infection in the acceleration of corrosion, through promotion of local acidosis. This effect should be taken into account when removal of temporary implants on revision of permanent implants is being considered clinically, especially if the prosthesis contain components known to be fabricated from stainless steel or cobalt-based alloys. Titanium-based alloys are somewhat stable under acidic conditions and thus has a lower relative risk in the presence of implant site infection.

Also, immunological effects do not appear to be sound justification for relative preoperative testing for metal sensitivity of patients who are scheduled to receive implants. However the medical history should include appropriate questions to determine if the patient has a history of suspicious allergy to metal or if he or she works in a setting that increase the risk of sensitization.

The results of tests for metallurgy may help to explain symptoms associated with loose, painful permanent implants that need to be revised without evidence of implant-site infection.

The clinical consequences of neoplastic transformation are sufficiently severe to require caution. Clinical evidence of neoplastic transformation associated with stainless steel or cobalt-based alloys is extremely scent. However it has been suggested that care can be exercised in the use of large surface area cobalt-based alloys, particularly in younger patients.

All of these goals can be achieved by careful study of biomaterial properties and careful selection of specific biomaterials for specific application together with good selection of the design used in different potentials.