Components and Materials Used for Total Hip Replacement: A Review

Context

Hip replacement or total hip arthroplasty (THA) is a common orthopedic procedure for patients with damaged or degenerated hips and chronic pain. For THA, the head of the femur is removed and replaced with a prosthesis that has a protruding ball. The ball fits into an acetabular cup that is secured to the pelvis; the cup may be lined to reduce friction and wear. According to the Canadian Joint Replacement Registry, 13,068 Canadians underwent THA between 2009 and 2010 — a number that has been on the rise since 2003. Although hip replacements are successful in reducing pain and improving function, revision surgery within 10 years may be necessary because of infection, dislocation, loosening, or other complications.

Technology

There are several designs of hip implants available, and different materials are used for the implant components. Modular hip implants, unlike standard models, allow for the choice of different femoral neck lengths and femoral head sizes, as well as modular acetabular cups. Various metals, plastics, and ceramics are used for hip implant components, each material having its own strengths and limitations.

Issue

Given the variety of designs and materials available for THA, a review of their comparative clinical effectiveness and associated adverse events will help to inform decisions about the prosthesis selection for THA.

Methods

A limited literature search was conducted of key resources, and titles and abstracts of the retrieved publications were reviewed. Full-text publications were evaluated for final article selection according to selection criteria (population, intervention, comparator, outcomes, and study designs).

Key Messages

For THA:

- Ceramic on polyethylene implants do not appear to be more effective than metal on polyethylene implants.
- Ceramic on ceramic implants may require fewer revisions after five years than metal on polyethylene implants.
- Modular stem implants may have lower early survival than standard implants but may be equal or better than standard implants over the long term.
- Large femoral head implants are likely beneficial compared with standard-sized implants.

Results

The literature search identified 386 citations, with no additional articles identified from other sources. Of these, 23 were deemed potentially relevant, with 4 studies meeting the criteria for inclusion in this review: 1 systematic review, 1 randomized controlled trial, and 2 non-randomized studies.

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