Comparing Types of Polyethylene Liners for Hip Replacements: Regular, Vitamin E-Infused, or Cross-Linked

**Context**
Total hip replacement (THR) is a common orthopedic procedure for patients with damaged or degenerated hips and chronic pain. For THR, 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, and the cup may be lined to reduce friction and wear.

**Technology**
The cups, balls, and cup liners of hip prostheses are made of various combinations of metal, ceramic, or polyethylene (plastic). For metal-on-polyethylene (MOP) hips, the ball is made of metal and the cup is lined with polyethylene. Alternatives to “regular” polyethylene liners include cross-linked polyethylene and newly developed vitamin E-infused polyethylene liners.

**Issue**
Wear and bone loss can lead to aseptic loosening of the components of a hip prosthesis, resulting in the need for hip revision surgery. New bearing surfaces (cross-linked polyethylene, vitamin E-infused polyethylene) have been developed to improve wear and prolong the life of hip prostheses. The vitamin E-infused version performed well in in vitro testing and in vivo testing in rabbits. But what is the comparative clinical and cost-effectiveness of the different polyethylene liners (regular, cross-linked, and vitamin E-infused)?

**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 predetermined selection criteria (population, intervention, comparator, outcomes, and study designs).

**Key Messages**
- Cross-linked polyethylene liners performed better than regular polyethylene liners with reduced:
  - Wear rate
  - Bone loss
  - Need for revision.
- There was no evidence (clinical or cost-effective) comparing vitamin E-infused polyethylene liners with regular or cross-linked liners.
  - An upcoming RCT* may address the gap.
- Cost evaluations are needed to determine whether more costly hip prostheses add value (i.e., improve function and provide longer prosthesis lifespan).

* Randomized controlled trial

**Results**
Of 334 citations, 21 potentially relevant articles were retrieved for a full-text review. No articles were identified from grey literature or handsearching. Of the 21 identified articles, nine met the criteria and were included in this review.

---

**DISCLAIMER:** The information in this Report in Brief is intended to help health care decision-makers, patients, health care professionals, health systems leaders, and policy-makers make well-informed decisions and thereby improve the quality of health care services. The information in this Report in Brief should not be used as a substitute for the application of clinical judgment in respect of the care of a particular patient or other professional judgment in any decision-making process nor is it intended to replace professional medical advice. While CADTH has taken care in the preparation of the Report in Brief to ensure that its contents are accurate, complete, and up-to-date, CADTH does not make any guarantee to that effect. CADTH is not responsible for any errors or omissions or injury, loss, or damage arising from or as a result of the use (or misuse) of any information contained in or implied by the information in this Report in Brief.

CADTH takes sole responsibility for the final form and content of this Report in Brief. The statements, conclusions, and views expressed herein do not necessarily represent the view of Health Canada or any provincial or territorial government. Production of this Report in Brief is made possible through a financial contribution from Health Canada.