Bone Morphogenetic Proteins in Surgery: A Review

Context
New bone growth is critical for successful spinal fusion surgeries and in the treatment of nonunion fractured limbs (fractures that have failed to heal after several months). Typically, a bone graft can be used to induce new bone growth, but, to achieve sufficient new bone growth, the application of recombinant human bone morphogenetic proteins (BMPs) has been used as an alternative or adjunct to bone graft procedures. BMPs are a group of growth factors that can stimulate bone growth. These proteins signal new bone growth through multiple pathways during bone healing.

Technology
Two recombinant human BMPs were approved for use by Health Canada in 2002. Recombinant human BMP-2 (rhBMP-2) is marketed as INFUSE and approved for spinal fusion surgery using another product, the LT-CAGE device. Recombinant human BMP-7 (rhBMP-7) is marketed as OP-1 and is approved for use following nonunion long bone fractures.

Issue
As with many growth factors, disruption of normal BMP signalling is routinely found in tumour cells. Of concern is the potential of BMPs used in surgery to increase the incidence of cancer. Other potential adverse events should also be considered before these biotherapeutics are used in any applicaton. A review of the clinical effectiveness and safety of BMPs in spinal surgery and long bone trauma surgery will help to guide decisions about their use.

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
- Using rhBMP-2 in certain lumbar fusion surgeries improves clinical outcomes.
- Using rhBMP-2 in the treatment of tibial fractures may result in less treatment failure and fewer secondary interventions.
- Evidence on serious adverse events is limited, but retrograde ejaculation with BMP use in certain lumbar surgeries is increased.
- There is a lack of long-term evidence on BMPs and cancer.

Results
The literature search strategy identified 363 articles, with 1 article identified from grey literature. Full-text retrieval of 56 articles followed screening of titles and available abstracts. Upon review, the following met the selection criteria: 6 systematic reviews, 2 randomized controlled trials, 4 non-randomized prospective controlled studies, and 12 retrospective cohort studies.