Long Bone Reamer with Controlled Directional Deflection

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Technology description

This technology, developed by researchers at the University of Louisville, consists of novel systems and methods for intramedullary preparations. In particular, the present invention relates to systems and methods for intramedullary preparations that make use of a directional reamer to selectively shape a medullary canal in a bone. By allowing for selective shaping of the medullary canal in bone, practitioners will be able to account for a wide variety of bone conditions and geometries, thereby allowing for superior treatment of fractures.

Intramedullary (IM) nailing of long bone fractures is one of several methods used by orthopedic surgeons to provide mechanical stability to a healing bone and, in recent years, has become the gold standard that is used whenever a specific fracture pattern allows. During IM nailing, the medullary canal is enlarged with reamers placed over a guidewire along the length of the marrow space of a long bone, such as the femur, tibia, or humerus. These reamers are typically manufactured in mm diameter steps and are typically used in multiple passes to form a canal within the medullary cavity of the bone. The resulting enlargement of the canal then creates a smooth, hollow tube of constant minimum diameter that allows thicker, more rigid IM nails to subsequently be used for fracture fixation.

Despite the advantages associated with the use of IM nailing for long bone fractures, a frequently encountered issue is that not all fractures have simple geometries. Bone fracture fragments can frequently lie out of their original position in the bone and heal partially in place. Moreover, often the shape of a bone is not tubular. For example, the bone shaft may be thicker anteriorly than posteriorly. In such a case, selective shaping of the medullary cavity or marrow space (i.e., medullary shaping) would allow for removal of bone where it is not needed while retaining the thickness of bone on the thinner side. Accordingly, there remains a need for systems and methods that can be used to shape an intramedullary canal in a bone.

The device developed at the University of Louisville addresses this problem. This system would allow for more controlled shaping of the intermedullary canal, thereby sparing the removal of bone tissue where removal is not medically necessary.

Advantages

Allows for selective shaping of a medullary canal in a bone;
Allows for removal of bone on one side while retaining the thickness of bone on the opposing side;
Allows for treatment of bone injuries which do not possess simple geometries.

Institution

University of Louisville