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Intramedullary polymer implant with angular stability for minimally invasive repair of pathological fractures

Patients with pathological fractures require quick stabilization for palliative care. This is necessary to achieve prompt pain reduction, early mobilization and simplified care, which in turn leads to improved quality of life.

The technique presented here is a minimally invasive surgical procedure for intramedullary stabilization of tubular bones. After creating a small skin incision, a catheter with attached Dacron (polyester) balloon will be inserted through a sheath into the opened, reamed intramedullary, which after proper reduction will be filled with a liquid monomer. The balloon will conform to the contour of the intramedullary. An optic fiber running through the balloon catheter is used to apply blue light with a wavelength of 436 nm. Depending on the implant size, the polymer will be cured within 300 to 600 seconds. The sole purpose of the balloon is to hold the liquid monomer in position while it is hardening.

The materials used in this procedure (Dacron and synthetic compound) have been in use for many years in the fields of angiology/cardiology and dentistry. At the end of 2008, the methyl acrylate used in this technique was approved for human fracture therapy and in 2011, it was approved for use in non-load-bearing tubular bones. Application for load-bearing bones of the lower extremities is still considered off-label use.

Until now, four patients, two women and one man with an average age of 76.5 years were treated for a pathological fracture in the upper extremities. Two patients had humeral shaft fractures. One had breast cancer, and the other prostate cancer. The third and fourth female patients had a pathological forearm fracture. The primary tumors were mammary carcinoma and plasmacytoma, respectively. Using the described technique, a quick and stable fracture repair was achieved via minimal access incisions (2-3 cm). Physiotherapy was started on the first post-op day. In all cases, a closed reduction was possible. The average procedure time was 49 minutes (33-73).

The individually intramedullary customizable implant features high longitudinal and rotational stability. The material is completely radiolucent allowing unobstructed intra- and post-op evaluation of the bone. For additional stability, angular stable insertion of locking screws is possible.