Innovative Polymer Based Medical Devices for Bone Surgery

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About the company:

Ekliptik, an EU (Slovenia) based company, is a developer and provider of advanced medical systems, especially for creating new tools and practices to improve the workflow of surgical medical procedures. By comprising top-notch technologies and an expert team of engineering, computer and medical experts Ekliptik is dedicated to bring the best medical solutions and methodology to the customers, whose needs are our only focus – the surgeons and their patients.

Ekliptik is committed to product and service excellence and is continuously striving to exceed its customer expectations. Company is continuously analyzing, developing, upgrading and improving our products by listening to our customers, complying and exceeding with regulatory requirements.

Ekliptik is engaged in the development and production of medical devices with innovations that provide numerous advantages to trauma surgeons, orthopaedic surgeons, and patients. Equipment developed by Ekliptik also improves the quality and reduces the cost of surgical procedures.
The key products of the company are medical devices combining advanced navigation systems with image guided software for long bone surgery. Ekliptik has developed and patented product/platform “GUIDING STAR« that enables surgeons to perform surgery procedures on long bones easily and more accurately. The plaform consists of three modules:

- LIDIS module - The LIDIS (Less Invasive Distal Interlocking System) module are innovative guides for interlocking of distal holes in cannulated intramedullary nails.
- BATTIATO module - The Battiato module is used for less invasive drilling with minimal use of x-rays for long screw placement in bone surgery.
- TOCOS module - The TOCOS module combines the latest micro navigational sensors with the innovative tools for the long bone reduction with the minimal use of x-rays.

Abstract

Intramedulary nails with interlocking became the most widely used standard for fixation of diaphyseal fractures. Placement of interlocking screws is technically demanding and significant exposure of the patient to x-rays is necessary. We developed Guiding Star as a technological platform that uses a computer controlled image-guided navigational system, designed for use in various types of surgical procedures; in combination with the LIDIS module it enables easy interlocking cannulated intramedullary nail with minimal use of X-Rays.

In LIDIS module we use internal and external probe in which micro 6DOF sensors are mechanically fixed. The probes are made of biocompatible PEEK and biocompatible titanium TA6V ELI.

In a present study we explore, in colaboration with Tomas Bata University in Zlin, the possibilities to replace the biocompatible titanium for the biocompatible polymers due to the demand for disposable and cost effective medical devices. We focus on the inner probe because it has the most important part build out of titanium (Figure 1).

The first end of the inner probe has to be fixed in a hole of intramedular nail with the special flat outward curving lamellae which performs the function of a spring and enables adaptation to various diameter of the intramedular nail chanel. All the mechanical properties of that titanium part were measured. The results of titanium mechanical properties were used as the base for search of adequate polymer substitute with a similar characteristic. Through diferent test we investigate the possible substitution of the titanium inner probe by polyeter ether ketone (PEEK) (Figure 2), which is known to posses excellen mechanical properties (Young´s modulus 3.6 GPa, tensile strength 90-100 MPa, glass transition temperature 143 °C) and biocompatibility. The crutial attention is paid to determation of the PEEK processing parametres to obtain desired result – PEEK based disposable probe.

The result of the study shows that the PEEK polymer could sucessfuly replace the titanium part of inner probe and it shows also the significant advatage for sterilization and disposable usages.

Figure 1: Titanium inner probe

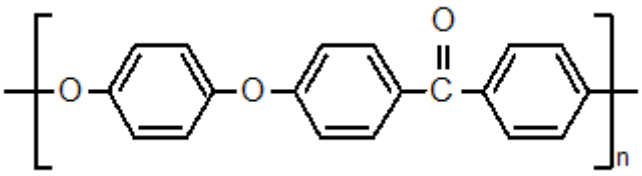

Figure 2: Chemical structure of PEEK