

ANNOTATION

Problem statement: Modern rigid endoscopes with a relay optical system and minimally invasive surgery based on them have many advantages over other types of surgical exposure, and are therefore widely used in medicine. Despite technological progress in the development of optical instrumentation, there remains a problem in terms of the fragility of a rigid endoscope, which is based on the principle of constructing rod lenses whose length is many times greater than their diameter, which is the reason for such frequent breakdowns and costs associated with them. The cause of the damage can be small (up to 1.6°) bends of the metal tube in the process of using the endoscope. Failure of the optical components of the endoscope during surgery can have serious negative consequences for the patient.

The aim of the work: is to develop a bend-resistant optical system for rigid endoscopes that can be integrated into standard rigid endoscopes without requiring changes in the internal configuration, changes in the stiffness of the tube, its components and materials.

The result: of this work was the modernization of the optical system of a rigid endoscope with a significant opto-technological and operational improvement of indicators, which is confirmed by the corresponding graphs of image quality in the ZEMAX environment. In addition, a comparative calculation analysis using the ANSYS Static Structural finite element analysis software system confirmed that the new semi-flexible optical system fully meets the physico-mechanical properties incorporated in it and allows tolerantly leveling the bends of the endoscope tube while significantly reducing the stresses arising in the optical system.

Conclusions: The chosen method of solving the problem, as well as the production technology, allows us to comply with the ratio of quality and commercial component, in which innovations in technical solutions cover losses from appreciation and complexity of the design with the provision of new advantages for a competitive confrontation with other manufacturers. Such modernization will make a significant contribution to the development of endoscopic microoptics, the quality of surgical interventions, patient health, the budget of the medical institution and the country as a whole.

Key words: rigid endoscope; rod lenses; endoscope flexibility.