Application of Computer Optimization Method of Minimally Invasive Surgical Access Based on Pre-Surgical Tomography Data

Introduction and Objective: During minimally invasive surgeries correctness of choice of access points with minimal distance to the “object” is of a particular importance. This allows using the length of the instruments efficiently. Nowadays the surgeon himself decides upon the method and surgical access points basing on standard methods and personal experience even though he has got the patient’s results of computer tomography. The aim of this work is to develop a helping system for optimization of surgical access based on the analysis of tomography research data for the surgeon.
Materials and Methods: Source data for solution of surgical access optimization problem are the results of tomographic examination of the patient, taken on CT-scanner. All found acceptable ways are reflected on tomogram, the shortest way is sorted out amongst them. 3D-digitizer is used for indicating the found point on the body surface. For the connection of digitizer coordinate system with tomogram coordinate system several control points (at least 4) are indicated both on the body surface and on the tomogram image and after that transition matrix from one coordinate system to another is worked out. The method was originally performed for the 10 patients with renal cysts, their average age was 51,5 (in the range from 30 to 69) years, men – 4(40 %), women - 6 (60%).
Results: Average time of an operation performed with the use of the computerized choice of the surgical approach was 29,5 (25-35) minutes. In all cases the shortest way to reach the affected kidney area was chosen and that helped to create good illumination of the operational field, comfortable conditions of work for a surgeon and there was no necessity to extend incisional wound. There were no complications during the operation and in the post-operative period.
Conclusion: Usage of the introduced computer program allows choosing optimal surgical approach during minimally invasive surgical procedures. This method is particularly perspective for teaching beginner surgeons. It can help them acquire skills in minimally invasive surgery.