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A NEW INSTRUMENT CHANGING SYSTEM FOR FLEXIBLE SURGICAL PLATFORMS

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PURPOSE

Up to now, the usability of the NOTES instruments is not intuitive and not yet manageable by single person. New mechatronic support systems are needed to overcome these challenges. These surgical platforms are operated usually from a console. Therefore, the surgeon depends on the help of his assistance for several tasks because of the physical distance between the master-console and the surgical (slave-) platform. To change the instruments is a task, which is normally performed by the assistant. The flexible design and the length of the manipulators can make this task challenging. Especially during insertion into the working channel there is a risk of contamination. It is the aim to develop a mechanical instrument delivery system to avoid the need for human assistance.

METHODS

The concept consists of four main components: magazine, changing unit, actuators and interface. The changing unit manages and changes a defined number of instruments and transports the required instrument into the working channel of the manipulator or removes it. Different instruments are supported; therefore the changing mechanics adjusts automatically to the outside diameter of the instrument. The instruments handgrips are fixed in a holder, which can be adjusted according to the handle design. The movable carriage of the instrument is connected directly via a kinematics with a servo motor. The command exchange with the manipulator is carried out via a standardized interface.

RESULTS

The prototype of the instrument changer was tested in the laboratory. HotClaw Olympus FD-420LR, Electrosurgical Knife Olympus KD-611L and Storz Flexible Biopsy Forceps were used as instruments. The flexible gastroscope 13806PKS (Karl Storz, Tuttlingen) was temporarily used as the manipulator. The entire exchange process takes 28 sec on average. The instruments are inserted with an accuracy of ±4,4mm (n=20; standard deviation 2.98mm).

CONCLUSION

The prototype of the instrument changer has been evaluated successfully in in-vitro experiments. Particularly, when a medical manipulator is used, the operator can change the instruments from the console and is not forced to rely on the help of an assistant. Actually a new manipulator is developed and the instrument changer as an important sub-component of the whole concept.