

## **ERGONOMIC HANDLE DESIGN FOR LAPAROSCOPIC SURGERY**

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### **Objective**

As an emerging market, laparoscopic surgery is now widely practiced in China, but the current laparoscopic instruments are not purposely designed for surgeons in China. Very often there are complains about the size and ergonomics not suitable for Chinese surgeons, sometimes post-operation pain or numbness can be caused by uncomfortable laparoscopic instrument. The objective of this study is to develop an ergonomic laparoscopic instrument handle to better fit the Chinese surgeon's hands in general to reduce discomfort and improve surgical performance.

### **Materials and Methods**

In order to get ergonomic data of the hands, 20 people were recruited to produce plaster hand models, and scanned with a non-contact 3D digitizer (RANGE 7, KONICA MINOLTA). The hand statues were produced using rapid prototyping technology and analyzed using ImageWare for getting characteristic curves and dimensions. Experiments of the prototype handle and existing handle were performed to evaluate performance of both handles.

### **Results**

The following dimensions were recorded based on the analyze: the distance between thumb-index web (a part of the hand between the thumb and the index finger) and the tip of thumb is 40mm, the distance between "Hu Kou arc" and the tip of the middle finger is 51mm, the width of palm is 91mm. Four characteristic curve equations have been identified. Surface electromyogram signals and questionnaire results revealed the hand comfort degree is improved.

### **Conclusion**

An ergonomic handle of laparoscopic instrument based on the dimensions of the Chinese hand has been developed. It shows that the new instruments are more suitable for Chinese surgeons. Further work is needed to improve the mechanical structure of the handle for further reducing discomfort and muscle fatigue.

