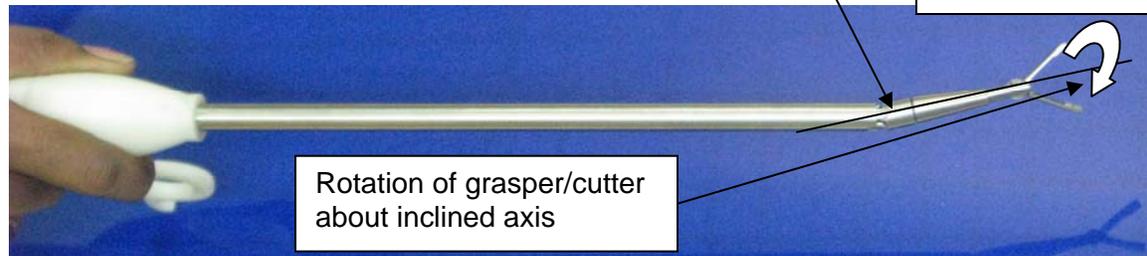
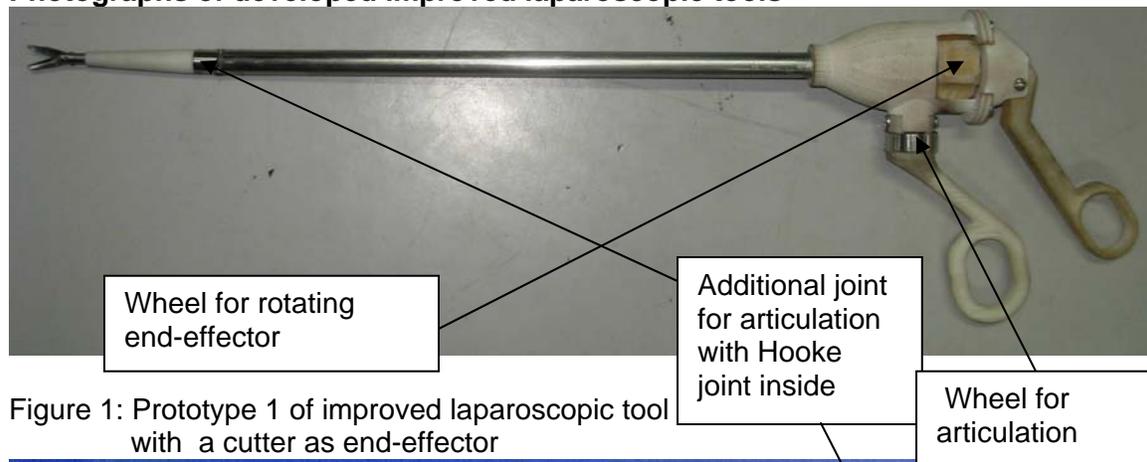


Improved Laparoscopic Surgical Tool

The improved laparoscopic tools, shown in Figure 1 & 2 below, overcome the lack of dexterity in minimally invasive laparoscopic surgery to a large extent. The new tool has an **additional joint** near the cutting/grasping end and one can actuate this joint using a finger as normally done for other degrees of freedom. As shown, the *rotation of the cutter/grasper is about the inclined axis* and thus is different from existing articulated tools. The additional joint allows the surgeon to **approach** the organ/tissue or the object being cut/grasped etc. **at different angles** and not only from one direction as in existing laparoscopic tools. *The increased dexterity allows the surgeon a) to avoid obstacles and other organs, b) access the surgery area more easily, c) provide a better viewing of the surgery area, d) the inclined axis enables fine motion of the cutter/grasper, and d) enable more complex suturing movements and operations.* The effect of the additional joint is similar to bending of the fingers and the resulting flexibility and increased dexterity is expected to significantly **reduce surgery time and stress** for the surgeon. An important feature of the new design is that the degrees of freedom **available in existing tools** are in **no way constrained or affected** by this extra joint, and due to the **modular nature** of the design, the end-effector can be changed easily.

Photographs of developed improved laparoscopic tools



Kumbhare, H., Goel, Piyush, Ramesh Makam, Ghosal, A., *Laparoscopic Apparatus* – Patent applied for in India and USA. Novelty claims agreed to by **WIPO**. Details available at

<http://www.wipo.int/patentscope/search/en/WO2011024200>