Novel Mechanism to Prevent Trocar Over-Puncture
Technology #14947-15811

Applications
- Laparoscopic surgery (trocar)
- Veress needles
- Venous access needles for catheter placement
- Epidural or spinal tap needles
- Lung puncture devices to correct collapsed lungs

Problem Addressed
In medical puncture access procedures, a device is inserted axially through layers of tissue to gain access to blood vessels, ducts, or body cavities. Although common, these procedures risk over-puncture. At the moment when the tissue yields and the tip of the device punctures the tissue, the device suddenly accelerates forward until the user can react and stop applying insertion force. On average, it takes at least several tenths of a second for the user to react to this change in force. Since the mass of the device is often relatively small for the force applied by the user, the resulting acceleration is considerable, and the device may travel to a significant depth into the patient before the user can stop its motion. This creates a dangerous and potentially deadly situation in which the tip of the instrument may accidently perforate delicate or critical organs and vessels in patients. This danger is further amplified by the fact that these procedures are conducted with limited or no visualization.

Technology
This invention presents a surgical puncture access device with a novel flexure-based retraction mechanism. A forward acceleration of the device tip at the moment of puncture causing over-puncture is alleviated by actively opposing the forward acceleration. The device presented in this invention retracts the blade in the direction opposite to a puncture force as soon as an incision is made. The retraction mechanism was specifically developed for a laparoscopic trocar; however, it can be applied to other puncture access devices, such as veress needles, venous access needles for catheter placement, epidural or spinal tap needles, and lung puncture devices to correct collapsed lungs.

Advantages
- Significantly improves safety during blind puncture access procedures
- Potentially applicable in a variety of other fields that require blind puncture access

Categories For This Invention:
Life Sciences
Clinical Applications
General & Plastic Surgery  
Other (Clinical Applications)  
Medical Devices  
Surgical

**Intellectual Property:**

Surgical puncture access  
Issued US Patent  
8,419,764  
Surgical puncture access  
Issued US Patent  
9,039,723  
Surgical puncture access with preload lock  
Issued US Patent  
8,894,679

**Inventors:**

Nikolai Begg

**Publications:**

* A Novel Tip-retraction Mechanism for Puncture Devices  
  2014  
* An Improved Puncture Access Tip-retraction Mechanism  
  J. Med. Devices  
  2013  
* Design and Development of a Novel Puncture Access Device  
  J. Med. Devices  
  2012  
* Blind Transmembrane Puncture Access: Design and Development of a Novel Laparoscopic Trocar and Blade Retraction Mechanism  
  Thesis (S.M.), MIT  
  2011

**External Links:**

Lemelson-MIT Student Prize 2013  
http://lemelson.mit.edu/winners/nikolai-begg  
MIT MechEConnects  
http://mecheconnects.mit.edu/  
TED talk (November 2013)  
https://www.ted.com/talks/nikolai_begg_a_tool_to_fix_one_of_the_most_dangerous_moments_in_surgery