Background

- Veress needle injuries due to blind insertion are rare (0.23%) but can lead to significant organ damage or hemorrhage.¹
- Current solutions do not account for operator variability during insertion, nor give the operator any additional information as to the position of the needle in the tissue.²⁻³

Existing Gap:

- No current devices for closed insufflation provide a controlled insertion rate and or information on the needle tip position.

Proposed Solution

We propose a two component system that is compatible with current disposable Veress needles.

- Motor driven insertion system with electrode system to determine the location of the needle during insertion.
- An electrode will be attached at the very end of the needle tip which will measure the electrical impedance of the surrounding tissue.

Problem

- The needle driver with motor housing was mounted directly to the positioning arm using a series of 3D printed PLA parts.
- We tested the ability of the motor to puncture tissue approximating the abdominal lining (pork belly).

Final Design: Insertion Device

- The needle driver with motor housing was mounted directly to the positioning arm using a series of 3D printed PLA parts.
- We tested the ability of the motor to puncture tissue approximating the abdominal lining (pork belly).

Final Design: Needle Electrode

- We fabricated a microscale interdigitated electrode attached to a 10 mm diameter rod to test impedance values during insertion through tissue layers.
- The impedance values were evaluated at different frequencies using an Arduino-powered function generator and an oscilloscope.

Conclusion

- This is the primary patent in the space of modified Veress needles. It only covers the addition of optical information.
- There are no current patents for impedance testing at needle tips (published literature).

Cost to Patent & Manufacturing:

- With minimal material modifications and more sophisticated processing techniques, we predict an overall bulk manufacturing price greater than $40. Additions such as sterilizable titanium oxide, more powerful motor, and sophisticated impedance system could significantly increase this estimate.
- Costs to the patient could increase by around $100 assuming a 250% markup after production.

Reimbursement & Device Status

- The Veress needle is not a conventional medical device. They are surgical instruments for laparoscopic surgery. These procedures covered by Medicare/Medicaid will support the use of the modified Veress needle system.

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References