Insertion Device for Post-Placental IUD Placement

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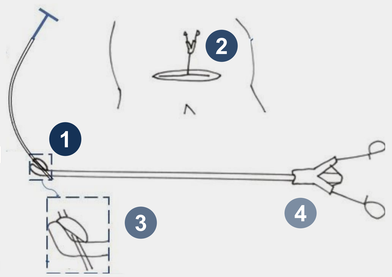
Post-Placental IUD Placement

SureThread

- SureThread is an intrauterine device (IUD) string holder to aid surgeons in the placement of post-placental IUDs.
- Goal is to decrease the frequency of lost IUD strings which often results in invasive and expensive checkups and removals [1].
- A safer method of insertion may reduce the number of unexpected pregnancies and allow for more affordable and easier IUD removal.
- This device has the potential to impact over 18 million women worldwide who get C-sections [2].

1. IUD strings held by grasper
2. Grasper inserted into incision by surgeon
3. Handle mechanism used to release IUD strings and leave them in cervix
4. Grasper is removed from incision site and IUD placement is complete



IUD Insertion During a C-Section

Concerns:

- Can we design a grasper that has enough friction to hold the IUD strings as they are inserted
- If the IUD strings are properly inserted, will they remain in place throughout the subsequent 6 weeks

Design Criteria

The insertion device must:

- Grasper-like device
- Disposable single use holder in sterile packaging
- Should not significantly increase surgical time
- Higher rate of visible strings following insertion

Standards

ISO 7151:1988 — Surgical instruments — Non-cutting, articulated

Prototyping

Initial Phase

3D Printed Uterus

3D Printed IUD

Sample IUD/Holder

Modeling Testing Environment

Model Pregnant Uterus

Model Dilated Cervix

Model Operative Environment

Artificial uterus made from silicon mold (~22.9-25.4 cm long and wide)

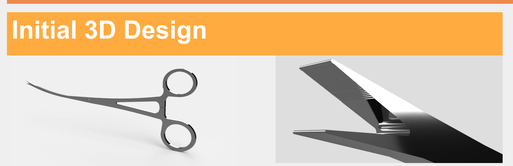
Cervix of the artificial uterus (~1 cm diameter)

Transverse incision of the artificial uterus with exacto knife

Opening of the artificial uterus through the C-section incision

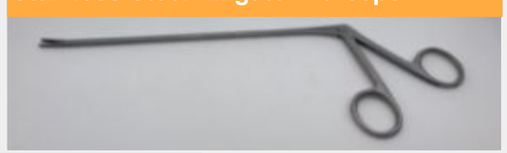
Forceps

Initial 3D Design



3D Print Test

Stainless Steel Alligator Forceps



Modified/Printed

[redacted]

Assembly of modified/printed forceps in Meshmixer following addition of locking mechanism.

[redacted]

The four separate components of the modified/printed forceps printing.

Testing Results

Functionality of Forceps in Testing Environment

- Inserted stainless steel alligator forceps through the c-section incision of artificial uterus
- Strings were successfully threaded through cervix after removing stainless steel forceps (n = 5)
- Will need to be repeated with 3D printed forceps

Evaluating Forcep Grip

- Stainless steel forceps successfully held IUD string for 1 minute both in the presence and absence of liquid (gelatin + water)
- Weights ranged from 10 to 200 g, increasing stepwise 5 g (n = 2)
- Will need to be repeated with 3D printed forceps

Dry

Wet

Simulated Blood

FUTURE DIRECTIONS

Build the forceps in plastic → Test hardness and interaction with uterus → Revise material

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REFERENCES

[1] S. Prabhakaran and A. Chuang, "In-office retrieval of intrauterine contraceptive devices with missing strings," *Contraception*, vol. 83, no. 2, pp. 102–106, 2011.
[2] S. Mishra, "Tale of the tails, the Missing POSTPARTUM IUCD Strings," *The Journal of Obstetrics and Gynecology of India*, vol. 67, no. 3, pp. 202–207, 2016.