

Laparoscopic Banding Device

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Client: T. Julian, M.D.

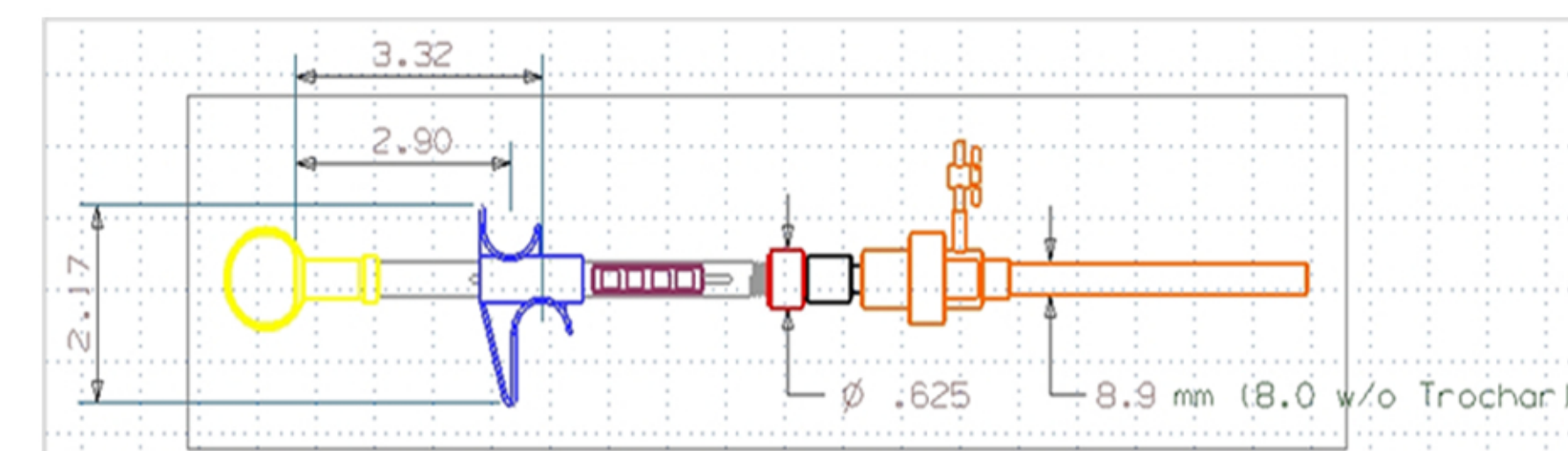
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Abstract

Our client, Dr. Julian, asked us to design a laparoscopic device for banding fallopian tubes that was less traumatic and more reliable than the one he currently uses. Last semester we constructed an enlarged prototype to test the design. This semester, we have built another prototype on a 2:1 scale and tested the suction and band release mechanisms of the device.



Design

Our design relies on two separate mechanisms. The suction mechanism secures the fallopian tube, and the band release mechanism releases a silicon elastomer band onto the fallopian tube, blocking passage of the ova.

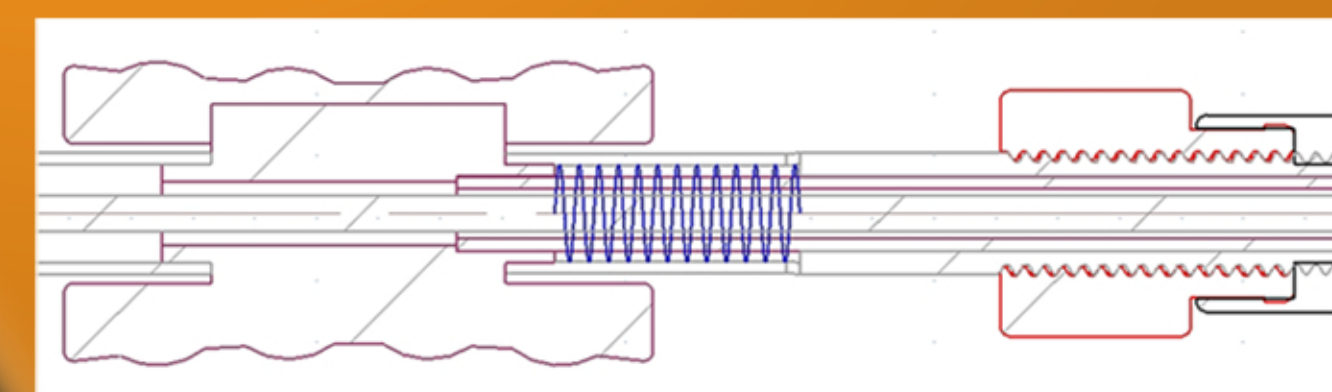
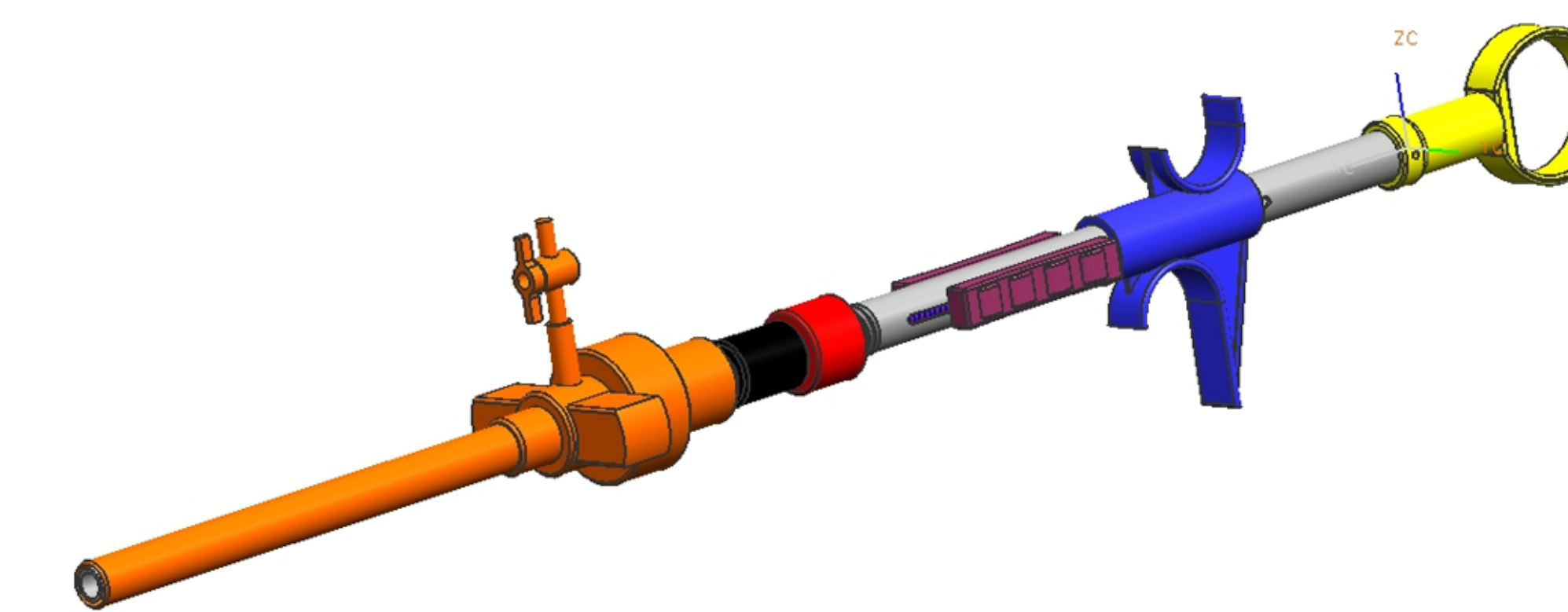


Fig 5: Side image of interior of design



Future Work

Next semester we plan to:

- Construct a 1:1 scale prototype
- Continue testing
- Design a simpler band loader
- Make any necessary modifications to design

Current Products

There are many different methods of tubal ligation, such as Pomeroy, banding and clipping. Banding, the method Dr. Julian prefers, is a good option because it is non-electrical and easily reversible. The product he currently uses, however, fails up to 80% of the time (Julian, 2007).

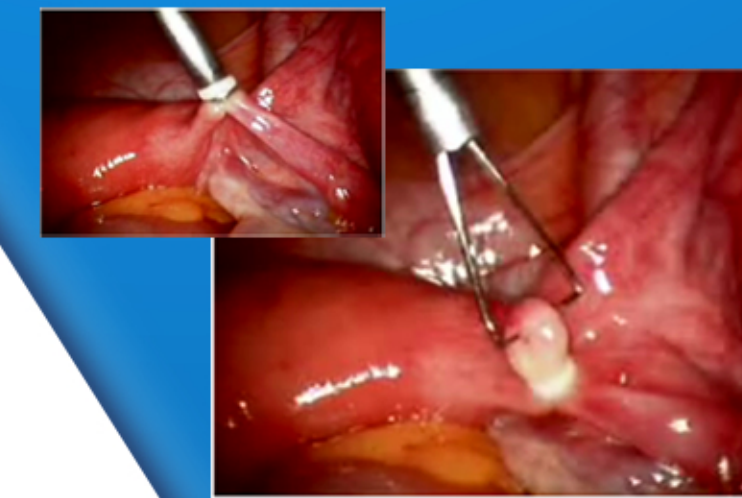


Fig. 1: The Falope Ring Band® in action. The device grabs the fallopian tube, bands it and releases it

Testing

We tested the suction mechanism on sheep fallopian tubes to determine the minimum force required to secure the tissue and the maximum force that would cause the tissue damage (see Figs 6-9). Slight damage was seen beginning at 0.2 ml. We also tested the prototype to determine how often the bands were released separately. We observed success in 100% of the trials performed.

Suction

The suction mechanism, which uses a small syringe, was shown to be gentler on the fallopian tube than the current product in the initial testing with sheep fallopian tubes (see Figs 6-8). The suction is capable of creating a secure hold on fallopian tubes while the band is released. A spring allows for controlled insertion and removal of the syringe.

Testing

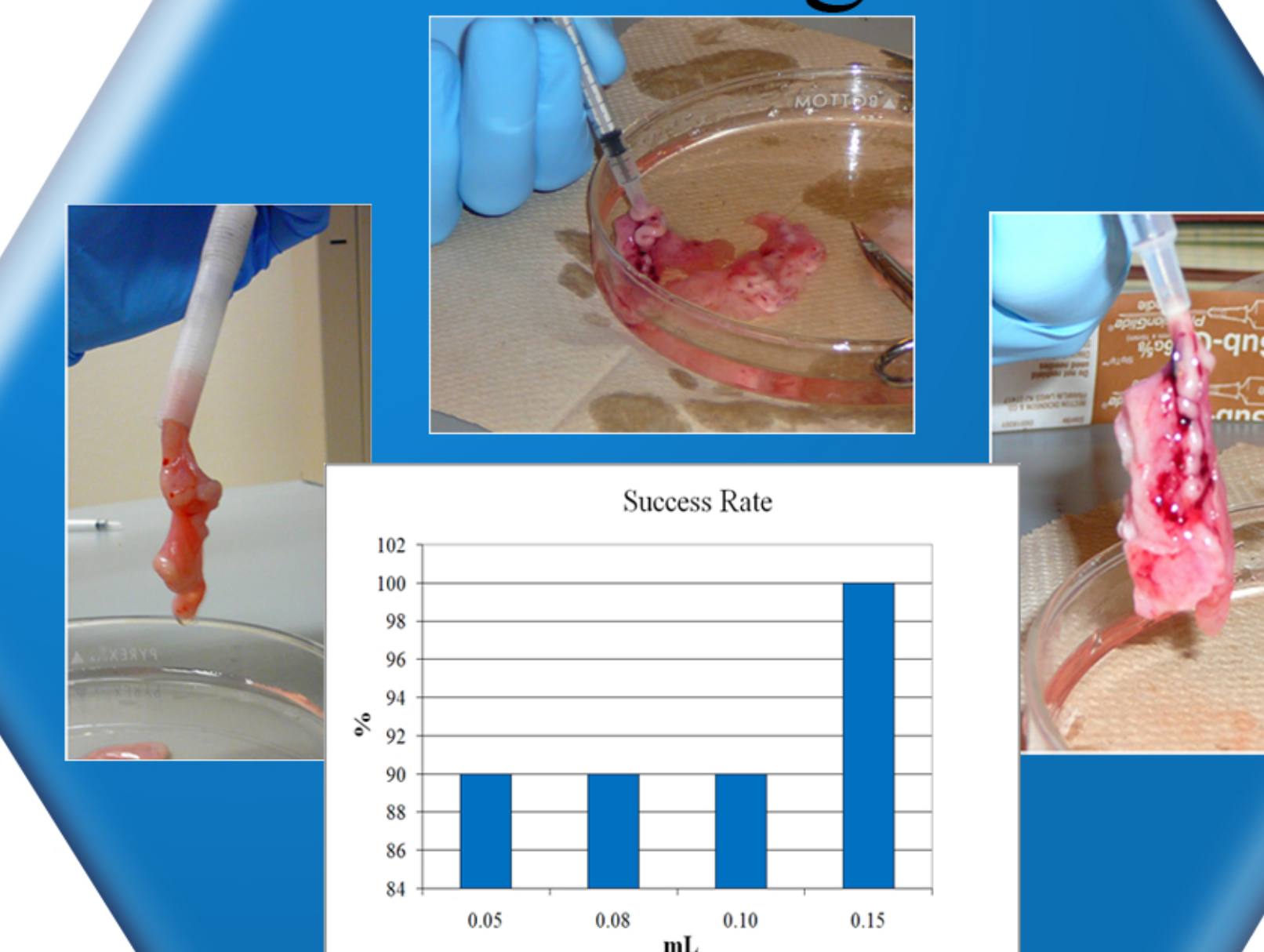


Fig. 6-9: Testing of suction mechanism (above). Success rate of suction mechanism at varying applied forces (bottom).

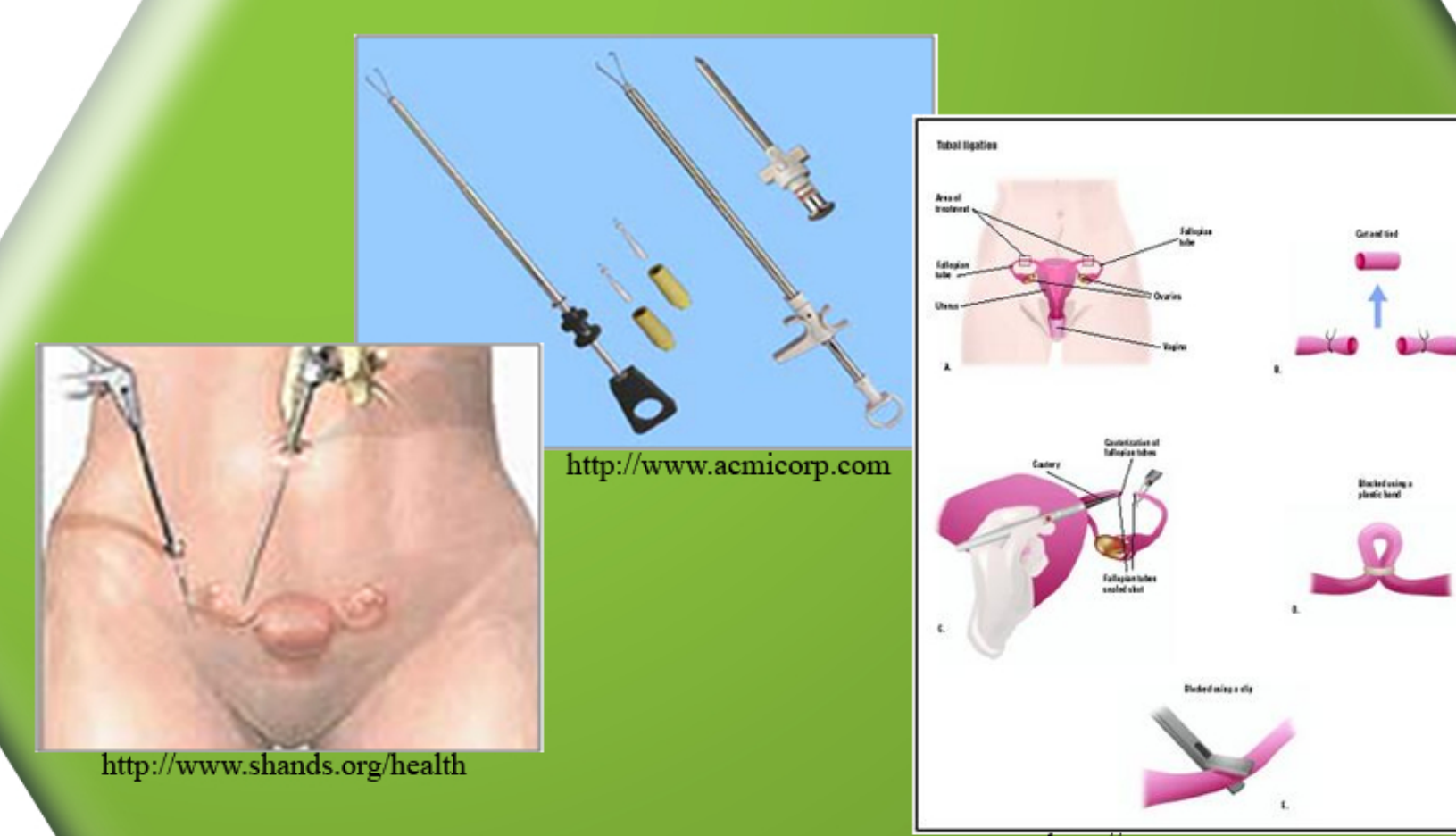
Conclusion

We believe that we are in the process of developing an easier, gentler, and more reliable way to perform fallopian banding for female sterilization. Initial testing indicates that our design gently grasps the fallopian tubes without causing damage, and releases bands more reliably than the device currently used by Dr. Julian.

Background

Tubal ligation is a permanent form of birth control, commonly called getting one's "tubes tied". This technique works by mechanically blocking the ova from reaching the uterus. One million tubal ligations are performed each year. The banding procedure is done laparoscopically for minimal invasiveness. The procedure is reversible, but doing so is difficult.

Current Products



Figs 2-4 (clockwise from left):
2) How the laparoscopic procedure is performed.
3) Devices produced by ACMI corp.
4) Various methods of tubal ligation.

Band Release

Our current design incorporates a threaded knob to advance a pushrod that releases the bands individually. This mechanism should provide a surgeon with greater precision than current instrumentation allows. A resorbable separator will be placed between bands to ensure proper release.

Design Criteria

The device must be:

- single use
- sterile and inert
- accurate with a failure rate of less than 20% (Julian, 2007)
- less than \$400 per device

References

- Dr. Thomas Julian, personal contact, 2007.
<http://ecli.org/nfp/contraception/tubal.php>
<http://www.acmicorp.com>
<http://www.alamocitypb.com>
<http://www.answers.com>
<http://www.professionalplastics.com>
<http://www.shands.org/health>
<http://www.tubal-reversal.net>
<http://www.youtube.com>

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