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### Background

- Lymphedema is a condition where the body cannot properly regulate the lymphatic system, resulting in pooling of the lymphatic fluid in affected limbs
- Lymphedema ails more than ten million Americans
- Many treatment options exist; however, most of them are ineffective, irritating, debilitating and cause other side effects such as nerve pain, muscle atrophy, and joint pain.
- The objective of this systematic review is to propose a novel method to treat Lymphedema.

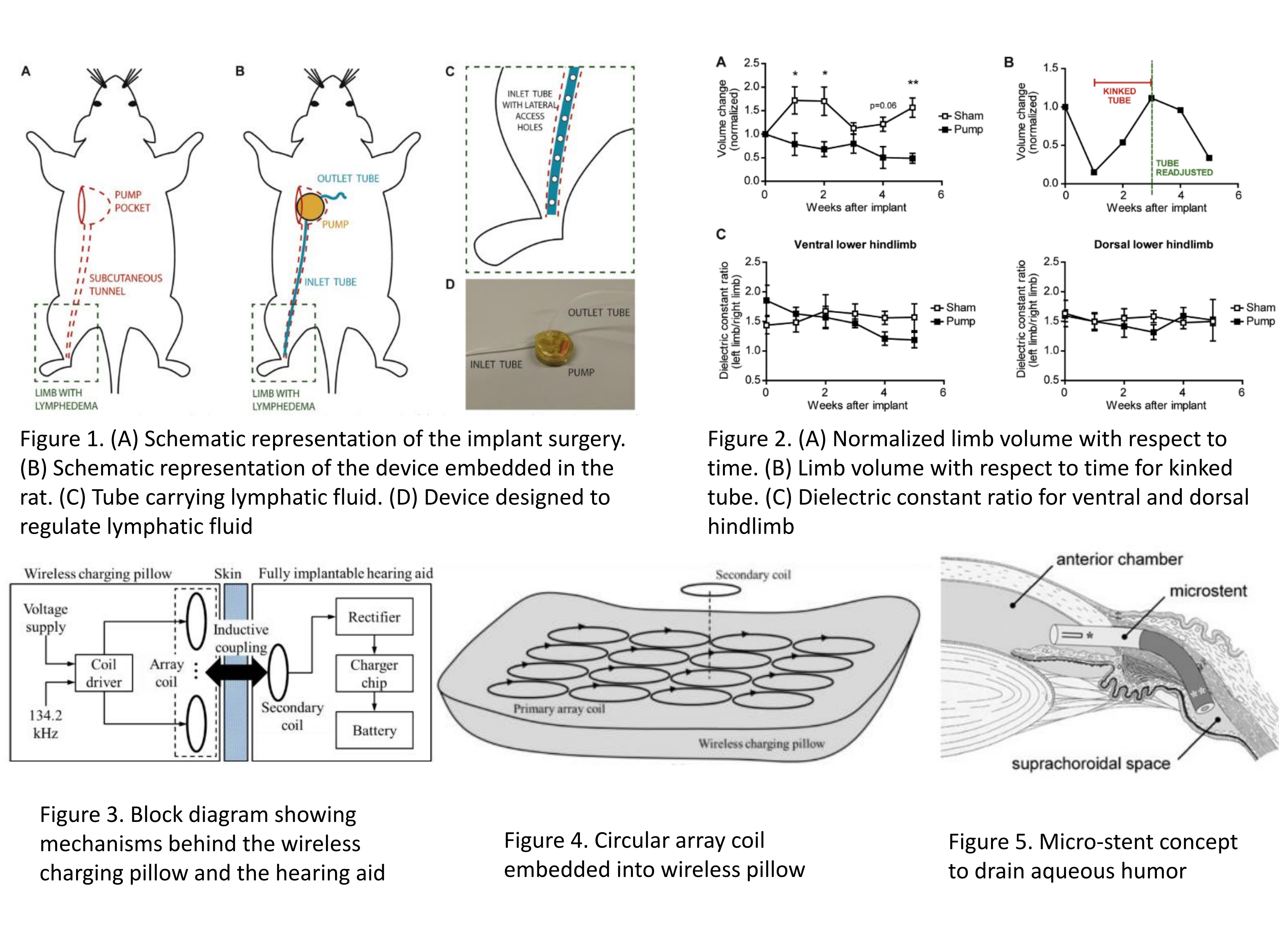
### Methods

- Problem was Identified
- Guiding question was framed
- Relevant work was identified
- Quality of the study was assessed
- Evidence was summarized
- Findings were interpreted
- Novel idea was formulated

### Results

- Lymphedema management and prevention studies were both conducted to find the best set of procedures and implants that retain lymphatic function.
- The initial rat model implant for lymphedema management is successful
- Other implanted devices were examined to improve the device presented in the rat model

### Figures



### Conclusion

- Lymphedema is mainly a side-effect of chemotherapy or radiation; the lymphatic passages are scarred and lymph nodes are damaged.
- Triacca et al. created a device that would be implanted in the affected area and act as a bypass. The device would facilitate the movement of the lymphatic fluid, preventing edema.
- The implant was successful in the rat model but needs to be modified before human clinical trials are started: the battery needs to last longer than eight weeks, and the tubes that will act as lymphatic passages will need to be made of a material that will be accepted by the body and will not kink during movement
- The solution I propose for the problem regarding battery life is to have a large rechargeable battery that will charge wirelessly when the user sleeps. Inductive coils would be placed in the patients sheets to increase portability and convenience. A custom inductive coil array would be created using the guidelines created by Lim et al.
- Tricca et al. encountered one case where the tubing in one rat became kinked; lymphatic fluid was not being regulated and as a result, limb volume increased. To avoid this, I adapted research from Siewert et al. regarding permeant catheters in the eye. After significant testing, silicone was identified as the material with a low elastic modulus and high extensibility.
- The modified device would be implanted in the upper axillary region allowing the silicone tubes to bridge the gap caused by scarring. This placement also allows wireless charging to occur easily.

### Discussion

- There is no standardized treatment for lymphedema, treatments can range from lymph drain massage, to continuous bandaging. This implant is capable of becoming the standard of care for all lymphedema patients once extensive testing and trials have been conducted.
- Current methods of lymphedema treatment such as bandaging, and manual lymph drainage can be paired with this implant to aid limb volume normalization.

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