



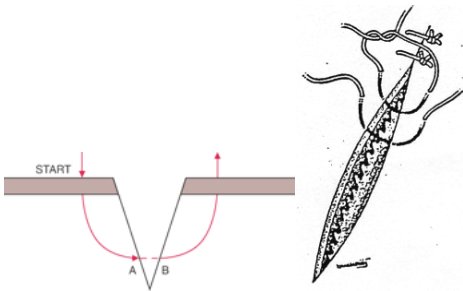
Title:

## Rodent Surgical Incisions - Closure Guidelines and Recommendations

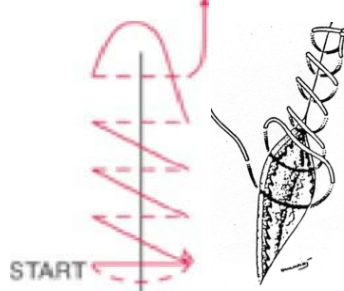
### Patterns

The most common closure patterns are simple interrupted and simple continuous. The simple interrupted pattern is typically used for closing a body cavity and/or skin as it minimizes the risk of dehiscence (splitting open). The simple continuous pattern is commonly used for non-tension bearing and buried sutures such as those placed in the muscle or dermis.

#### Simple interrupted:

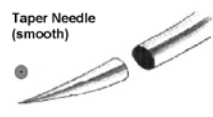
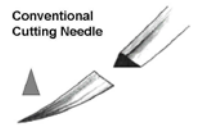


#### Simple continuous:



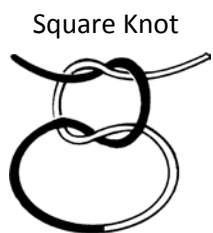
### Needle

- Surgical needles come in two configurations; tapered or cutting.
  - Cutting and reverse cutting needles have sharp edges and are best used for skin suturing.
  - Non-cutting, taper (round) needles are used for suturing easily torn tissues such as peritoneum, muscle or intestine to minimize damage to the tissue but in rodents can be used for skin closure as well.



### Knots

- Tie all suture using square knots. Two square knots (4 throws) should be sufficient for security
- For external sutures, skin approximation is the goal, therefore knots should be loose enough to allow for blood flow at the skin edge to minimize tissue ischemia.



### Selecting Closure Material

#### 1. Suture

- Suture sizes appropriate for skin closure for mice would be 5-0 or 4-0 and rats would be 4-0 or 3-0. Smaller suture (6-0) would be recommended for the ligation of a vessel as needed for cardiovascular procedures.
- Suture is available in absorbable and non-absorbable options. Non-absorbable suture must be removed in 14 days, once the incision has healed.
- **Silk must not be used for skin closure** due to an increased potential for microorganisms from the surface of the skin to wick into the incision. The use of silk has also been associated with a local tissue reaction and inflammatory response.



2. Wound clips

- Wound clips can be used for rodent skin closure. They must be applied and removed with a specific applicator. They differ from skin staples, which may be used in larger animals (i.e. dogs and pigs), in that they provide apposition but do not penetrate the skin.
- A minimum of 0.5 cm space is required between wound clips to allow blood flow to the wound and encourage healing.
- Wound clips must be removed in 10-14 days once the incision has healed.



3. Skin glue

- Skin glue, can be used for small(less than 0.5 cm), non-tension bearing incisions and will dissolve as the incision heals.

Post-operative incision care

Rodents must be closely monitored and incisions assessed post-operatively to ensure that sutures remain intact until the incision has fully healed. The overall health of the animal and the incision should be evaluated to better identify inflammation (redness, swelling, heat, pain) and/or infection (discharge) to allow for prompt intervention. Frequency of oversight should be as described in the animal use protocol and in keeping with the expectations of the IACUC rodent surgery policy.

If you are unfamiliar with wound closure materials and/or how to utilize these materials, please consult a ULAR veterinarian before choosing a material or attempting wound closure. ULAR provides training, free of charge. Please contact us at [ulartraining@osu.edu](mailto:ulartraining@osu.edu).

Table 1: Common Wound Closure Materials

Material	Characteristics/Common Uses
Polyglactin 910 (e.g. Vicryl®)	Absorbable. Completely absorbed after 60-90 days. Braided. Used most often for soft tissue approximation and ligation. Low reactivity.
Polyglycolic acid (e.g. Dexon®)	Absorbable. Completely absorbed after 60-90 days. Braided. Excellent handling. Used most often for soft tissue approximation and ligation. Low reactivity.
Polydioxanone (e.g. PDS®)	Absorbable. Excellent retention of tensile strength (maintains strength longer than all other absorbable suture materials). Completely absorbed after 6 months. Monofilament. Used most often for soft tissue approximation and ligation. Low reactivity. Optimal when extended wound support but ultimate absorption is desired. Great for skin closure.
Nylon (Ethilon®)	Non-absorbable. Inert. Used most often for general closures. Should be removed after wound has healed (10-14 days). Available as a monofilament and braid (braided is coated with silicon).
Silk	Considered non-absorbable, but is undetectable in the site after 2 years. Tissue reactive. High coefficient of friction Braided. Excellent handling. Preferred for cardiac procedures. <b>Not for use in skin closure.</b>
Stainless steel wound clips	Non-absorbable. Inert. Requires removal from skin after wound has healed (10-14 days). Require special instrument for insertion and removal
Cyanoacrylate (e.g. Vetbond®, Nexband®)	Skin glue. Used for non-tension bearing skin incisions.



**REFERENCES:**

- IACUC Rodent Survival Surgery Policy <http://orrrp.osu.edu/files/2013/07/Rodent-Survival-Surgery.pdf>
- ULAR Veterinary Best Practices for Rodent Survival Surgery  
<http://ular.osu.edu/resources/veterinary-best-practices/best-practices-for-rodent-survival-surgery/>
- Slatter D, Textbook of Small Animal Surgery, Saunders, 2002
- <http://www.alnmag.com/articles/2013/09/understanding-and-selecting-surgical-suture-and-needle>
- <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2587003/>
- <http://www.bumc.bu.edu/surgery/training/technical-training/suturing-basics/>
- [http://www.olivelab.org/uploads/6/3/6/2/6362060/2014\\_-\\_csh\\_protocols\\_-\\_sastra.pdf](http://www.olivelab.org/uploads/6/3/6/2/6362060/2014_-_csh_protocols_-_sastra.pdf)