Surgery in Amphibians

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KEYWORDS

• Amphibians • Surgery • Anesthesia • Analgesia • Skin surgery • Celiotomy • Gastrotomy • Cystotomy

KEY POINTS

- Most surgical procedures described in reptiles (especially lizards) can be undertaken in most amphibians.
- A major concern of the surgery in an amphibian is to provide adequate anesthesia and analgesia.
- For any surgical procedures, it is necessary to be familiar with the anatomic and behavioral differences between amphibian species commonly kept in captivity.
- In all cases, the skin of patients must always be kept moist with dechlorinated water.
- Surgical celiotomy provides access to most of the major internal organs, and therefore is useful for a range of surgical procedures including exploration and biopsy.

INTRODUCTION

Although concentrated in the neotropical countries, amphibians are globally distributed except in the polar regions of Antarctica. They display a diversity of life history and reproductive strategies to suit almost all habitats, from rain forests to deserts. New species continue to be discovered. There are 3 orders of amphibians: Anura, Caudata, and Gymnophiona. The AmphibiaWeb database currently contains 7416 amphibian species (May 22, 2015).[1] Only amphibian species commonly maintained in captivity are discussed here; therefore, caecilians have been excluded. Clinicians should not hesitate to advocate a surgical manipulation of amphibian patients. They heal well, tolerate blood loss, and tend to have fewer postsurgical complications than do higher vertebrates. Early amphibian surgical reference goes back almost 70 years, mostly developed in research.[2] Since then, surgery in amphibian research has progressed to amazing procedures like facial transplantation in *Xenopus laevis* embryos or to participate in conservation like, for instance, implantation of radiotransmitter.[3,4] Over the past 2 decades, veterinarians have gained experience thanks in large part to the pioneering work of G.J. Crawshaw, F.L. Frye, B.R. Whitaker, D.L. Williams, and

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K.M. Wright.[5–8] Most clinicians who wrote much of the earliest veterinary work published with emphasis on clinical cases.[9–15] This overview provides the practitioner with some pragmatic advice on how to conduct routine and advanced surgery in amphibians.

INDICATIONS AND CONTRAINDICATIONS

Commonly performed surgical procedures include wound debridement and repair, skin biopsy, abscess/neoplasm/parasite removal, and prolapse replacement/repair. Celiotomy is indicated for laparotomy exploration, laparoscopy, gastrotomy, cystotomy, and reproductive surgery. Orthopedic surgery mainly includes digit and legs amputation. Ophthalmologic surgeries include eye enucleation and lens surgery.

Contraindications are mainly related to the anesthetic risks. Practical recommendations for amphibian surgery should follow the edict primum non nocere (first do no harm).

EQUIPMENT

Clear plastic drapes are generally advocated for amphibian surgery. They tend to isolate the surgical site for aseptic procedures and help to keep the surrounding skin moist by reducing evaporation. One may use a combination of cold steel, radiosurgery, or diode laser. Skin incisions in amphibian patients are best made with a number 15 or 11 scalpel blade.[16] The diode laser has been used infrequently in amphibians to remove cutaneous lesions and neoplasms. But subjective assessments indicated that postoperative skin infections were reduced compared with either radiosurgery or sharp excision.[17] Hemostasis during procedures with limited expected hemorrhage may be achieved by electrocautery or diode laser. To allow the surgeon to apply localized pressure to a small vessel and keep track of blood loss, cotton-tipped spears or applicators are less traumatic and more manageable in small confined spaces than standard gauze squares. Most amphibian patients are less than 1 kg. Microsurgical instruments, like ophthalmologic instruments, with fine, small tips, are preferred. Plastic, self-retaining retractors (eg, Lone Star retractor [CooperSurgical, Inc., CT, USA]) can be adjusted to fit different sizes of incisions. Eyelid retractors can be useful for retracting coelomic incisions. Some form of magnification may be necessary, particularly with smaller patients. Between mammals and amphibians, the absorbability and reactivity of many suture materials is not the same. *X laevis* has been used as a model to investigate the gross and histologic tissue reactions to 5 commonly used suture materials: 3 to 0 silk, monofilament nylon, polydioxanone, polyglactin 910, and chromic gut. Monofilament nylon elicited the least histologic reaction and, therefore, seems to be the most appropriate choice for use in amphibian skin.[18] Alternatively, it is possible to use cyanoacrylate tissue adhesives for skin closure or over sutured incisions to ensure a waterproof barrier and to prevent bacterial colonization. Absorbable sutures, such as polyglactin (Vicryl, Ethicon, Somerville, NJ) and polydioxanone (PDS, Ethicon), are appropriate for internal use including muscle.[16] Taper needles are preferable to cutting needles, and it is usually possible to remove skin sutures after 14 days.[19] Insufflation is needed in laparoscopy to improve the visibility of all organs. A simple syringe for air is practical for a simple endoscopic examination. But a carbon dioxide (CO_2) insufflator with silicone tubing is needed for endoscopic surgery. In the author's experience, the endoscopic procedure should not last more than 10 minutes. Despite the variation in size and the nature of the procedures that may be performed, the basic endoscope system consist of a 2.7-mm diameter, 18-cm length, 30° oblique