Incidence of post-surgical complications of ovariohysterectomy and orchiectomy in field conditions

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Abstract

In many developing countries, one of the major public health challenges is to control overpopulation of dogs and cats while considering the welfare of these animals. The objective of the current study was to determine the incidence of post-surgical complications arising from ovariohysterectomy and orchiectomy surgery in Nicaragua under clean field conditions. The purpose of the study was to determine if described methods are a viable and safe option for performing sterilization surgeries on dogs and cats in situations where traditional surgery facilities and or/certain supplies are not available. A total of 181 ovariohysterectomies and orchiectomies were performed in May and June 2010. The animals ranged from 1.5 months to 13 years old. The first author performed a post-operative visit for a total of 132 animals four days following the procedure; 4.5% (6/132) of animals had redness of 3 or higher on a scale 0 to 5; 6.1% (8/132) of animals had swelling 3 or higher on a scale 0 to 5; 8.3% (11/132) of animals had skin dehiscence 1 or higher on a scale 0 to 5. No animal (0/132) had wound discharge and <1% (1/132) of animals died post-operatively due to ovariohysterectomy or orchiectomy. It is concluded that ovariohysterectomies and orchiectomies performed in field conditions have a similar rate of wound complications as elective surgeries performed in the United States in a clinical setting.

Keywords: Spay, neuter, ovariohysterectomy, orchiectomy, complications, field conditions

Introduction

As in many developing countries, in Nicaragua one of the major public health challenges is to control overpopulation of dogs and cats while considering the welfare of these animals. In 2004, the Pan-American Health Organization in conjunction with the Nicaraguan government identified management of domestic and stray animal populations as a core domain of public health in the country.[1,2] Traditionally, pet animals are maintained outdoors and are free to roam. Consequently, intact animals are able to breed without restriction leading to canine overpopulation especially in the larger cities of the Pacific Coast.[3] Anemia is also endemic in children in Nicaragua, the second poorest nation in the hemisphere after Haiti, and high incidence of hookworm infestation has been identified as a confounding factor in this health problem.[3] Additionally, socioeconomic conditions result in limited resources for pet owners to seek medical care for their pets.[4] Unlike developed countries, there is no control of stray animals, and they roam freely in streets and many of them starve or are killed inhumanely by people that may consider them a nuisance. Non-Government Organizations (NGO) with the help of volunteers and local partnering veterinarians perform ovariohysterectomies and orchiectomies to assist in population control of the stray animals. World Vets (worldvets.org), a United States-based international NGO provides veterinary aid in many countries, including Nicaragua. The objective of the current study was to determine the incidence of post-surgical complications arising from spay and neuter surgery in Nicaragua under clean, field conditions. The outcome of the study will be used to determine if described methods are a viable and safe option for performing sterilization surgeries on dogs and cats in situations where traditional surgery facilities and or/certain supplies are not available.

Materials and methods

Field clinics and conditions

Field clinic 1 is a newly-built building located within a school of agriculture and cattle production. The facility has overhead lights, electricity and running water. Surgery tables are made of tile. Field clinic 2 is vacant building located at a local church. The facility has natural lighting, electricity, and running water. Surgery tables are made of wood.

Each field clinic had work stations for pre-surgical consultations; surgical preparation including induction, IV catheter placement, shaving and surgical scrub; surgery; recovery; and instrument cold sterilization. There was limited and unreliable availability of the electricity and running water in both field clinics. Water was brought in bottles and jugs to be used onsite. Ventilation was primarily accomplished by opening the doors and windows. Fans were available and working when the electricity was on. There was no fly control.

A new clean drape was utilized for each patient. The surgeon used a new pair of sterile gloves for each procedure, but no surgical masks or gowns were used. Some surgeons used surgical caps during the procedure. Prior to the start of surgery for the day, hands were scrubbed with chlorhexidine scrub and hand sanitizer was used between patients when changing sterile gloves. The surgical tables were sprayed with common household disinfectant spray between surgeries. All the surgical instruments were scrubbed with soap and water to remove any blood or debris and then rinsed in water. They were then cold sterilized by placing them in a disinfecting solution for a minimum of ten minutes. The cold sterilization was accomplished using Steris Amerse 2 (Steris Healthcare, Mentor, OH), a one-step germicidal detergent with the active ingredients being o-phenylphenol and p-tertiaryamylphenol in a 1:128 use-solution.

Consultations and pre-surgical examination

The owners were brought into an examination room with their pet for a pre-operative consultation and physical examination during which any unusual findings were noted and the animal's weight was estimated. Dogs were given injectable anesthetics, including a combination of acepromazine (dose range from 0.06-0.4 mg/kg), atropine (0.02-0.12mg/kg), and morphine (0.1-1.0 mg/kg). Acepromazine, atropine and morphine were administered subcutaneously as a pre-anesthetic medication. For analgesia, cats were administered nalbuphine pre-operatively and dogs were administered ketoprofen post-operatively. The drug selection was based on limited availability in the country. Cats were kept in a carrier until they were ready for induction of anesthesia. Cats were given a combination that included ketamine, xylazine, acepromazine, and nalbuphine for induction. One bottle of ketamine, 50 mg xylazine, 2.5mg acepromazine, 10 mg nalbuphine where combined into one bottle. Cats were dosed according to weight based on the following guidelines: <3 lbs - 0.3 ml IM, 3-4 lbs - 0.5 ml IM, 5-6 lbs - 0.6 ml IM, 7-9 lbs-0.7 ml IM, 10-12 lbs -0.8 ml IM, and >13lbs - 0.9 ml IM. This protocol maintained cats in an adequate plane of anesthesia throughout the surgical procedure for both ovariohysterectomies and orchiectomies. At the conclusion of the procedure, anesthesia was reversed using yohimbine (dosed at 0.1 mg/kg) intravenously. Nitenpyram (Capstar®, Novartis Animal Health, Basel Switzerland)) was administered orally prior to surgery if the patient had an excessive number of fleas or ticks. A veterinary technician assisted in intake, premedication, and surgical preparation of patients. Volunteer United States-based veterinarians and veterinary students from accredited veterinary colleges were involved in all procedures. The lead veterinarian, an experienced US-veterinarian, provided an orientation to the surgical team which included veterinarians and students involved in various aspects of animal handling and surgeries.

Surgical preparation

An intravenous catheter was placed (most often in the cephalic vein) in all pre-medicated dogs. Anesthesia for both ovariohysterectomies and orchiectomieswas maintained with a combination of ketamine and diazepam. The ventral abdomen of all animals was shaved and scrubbed with chlorhexidine. Alcohol was applied to the skin prior to surgery for a contact time of three to five minutes.

Surgery

A veterinarian performed surgeries with a veterinary student assisting and/or performing various aspects of the surgery under direct supervision. A variety of surgical techniques were used based on the surgeon's preference but the fundamental procedure was removal of the ovaries and uterus with proper

hemostasis. Absorbable sutures were used which consisted of poliglecaprone 25, polyglycolic acid, polydioxanone, and chromic catgut.

After induction of anesthesia, patients were placed in dorsal recumbency and the ventral abdomen was clipped and prepared for an ovariohysterectomy or orchiectomy. Ovariohysterectomies were performed via a ventral midline incision. The majority of the orchiectomies were performed using a pre-scrotal approach; however, one veterinarian used a scrotal approach. Open and closed orchiectomy techniques were used at the discretion of individual veterinarians. For ovariohysterectomies, three layer closures were used: simple interrupted suture pattern in the linea alba, simple continuous in the subcutaneous layer, and intradermal in the dermal layer. Tissue adhesive was placed on the incision to achieve further apposition. For ovariohysterectomies, tattoo ink was placed on or near the incision after closure in order to allow future identification of sterilized animals. Lidocaine was injected on both sides of the incision following surgery to provide post-operative analgesia. Total surgery time was between 5 and 115 minutes. An assistant administered additional anesthetic as needed throughout the surgery.

Recovery

During recovery from anesthesia patients were placed in pre-designated areas monitored by students, volunteers, or technicians at all times. Animals were discharged to owners after adequate recovery (standing and able to walk) from the anesthesia. Prior to being discharged, patients received injections of benzathine penicillin G and procaine penicillin G and morphine. Pyrantel pamoate was administered orally. Insecticides for control fleas and ticks were administered topically. Additional analgesics (tramadol), anti-inflammatories (carprofen) and antibiotics (doxycycline, cephalexin, or amoxicillin) were occasionally dispensed for patients at the veterinarian's discretion.

Post-operative patient visits

Patients were visited at their homes four days after surgery to evaluate the animal and the surgical site. A questionnaire (appendix) was read in Spanish to each owner by the first author. Body condition score and wounds were assessed and the environment in which the animal was maintained after surgery was observed. Some patients were lost to follow-up due to their remote location or inability to contact their owner.

Results

Animals were presented with a number of pre-existing conditions including, but not limited to pyometra, flea and tick infestation, biting louse infestation, pregnancy, transmissible venereal tumors, estrus, external and internal tumors, heart murmurs, probable ehrlichiosis, hepatomegaly, ascites, traumatic injury, bite wounds and cryptorchidism.

Surgical complications included three dropped ovarian pedicles and one torn uterus as well as hemorrhage in several patients (common with ehrlichiosis) and one incident of inadvertent partial thickness laceration of the serosa of the jejunum. Bowel adhesions were also noted. Anesthetic complications included seizures (n=2) and apnea (n=11). One patient was administered an incorrect dose and type of induction agent but recovered uneventfully.

The post-operative home environment ranged from outdoors (either tied or free roaming) on dirt to indoors on tile floors. Many pet owners did not have transportation. Consequently, owners would walk the animal home, take them on a bicycle or cart or carry them. A few were transported by motor vehicle.

Table 1. Outcome of canine and feline ovariohysterectomies and orchiectomies under field conditions.

	Week 1	Week 2	Week 3	Week 4	Total	Percent
Total number of animals seen for surgery and/or consultation	206	178	164	127	675	
Dogs spayed	26	30	16	17	89	
Dogs neutered	5	8	13	19	44	
Cats spayed	11	8	7	5	31	
Cats neutered	4	2	5	6	17	
Total post-operative evaluations	36	37	33	26	132	73
Redness score 3-5[*]	1	1	2	2	6	4.5
Inflammation score 3-5[*]	1	2	3	2	8	6.1
Skin incision dehiscence	1	4	6	0	11	8.3
Surgical site discharge score 3-5[*]	0	0	0	0	0	0
Deaths associated with surgery[†]	0[‡]	0	1[§]	0[**]	1	<1

[*]Assessment scores of 0-2 were common and were considered to be within normal limits. Thus, these results were not included in the data reported in this table.

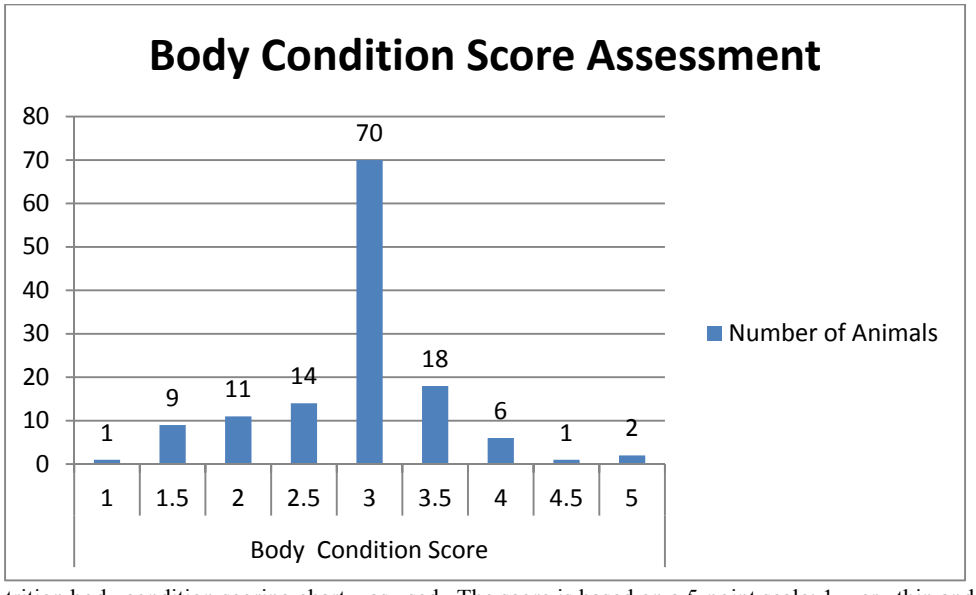
[†]A total of four deaths occurred during this study. Three were not related to the spay/neuter procedure and are not included in the data reported in this table. Details of the unrelated deaths are included below.

[‡]One patient was a puppy that was presented with a proptosed eye following an attack by another dog. The eye was enucleated but the puppy died post-operatively. Blood was found in the lungs upon intubation for cardiopulmonary resuscitation. Death was attributed to trauma prior to presentation.

[§]A dog was euthanized three days following orchiectomy due to poor recovery from surgery. A cat died pre-operatively after injection of anesthetic.

[**]A dog had been struck by an automobile and was presented with a lacerated scrotum and an exposed testicle. The dog was neutered but died the day following surgery. Death was attributed to trauma from the accident.

Table 2. Body condition score[§§] of canine and feline patients presented for ovariohysterectomies and orchiectomies in field conditions.



[§§]Hill's Pet Nutrition body condition scoring chart was used. The score is based on a 5-point scale; 1=very thin and 5=obese.

Discussion

The purpose of this study was to assess the incidence of post-surgical complications following ovariohysterectomy and orchiectomy of dogs and cats under clean but non-sterile field conditions. Although surgical conditions were not ideal in that surgery was performed neither in aseptic conditions nor on ideal surgical candidates, the vast majority of animals recovered from surgery with minimal or no

complications. Although post-operative care instructions were discussed with each owner, follow-up visits revealed a number of animals did not have appropriate post-operative care by the owner or caretaker which likely was a contributing factor to some of the complications.

Week 1. 1) A dog with redness had been licking her incision every day since surgery. 2) A cat with swelling had kittens that were still nursing. 3) A dog with minor skin dehiscence had been licking her incision. All of these complications were most likely due to inadequate post-operative care.

Week 2. Skin dehiscence: Surgery in three out of four animals with skin dehiscence was supervised by the same veterinarian. It is likely that the intradermal sutures were not closed with appropriate tension. The other case of skin dehiscence occurred in a cat that had been allowed to go outdoors too soon after surgery.

Week 3. Skin dehiscence: Five out of six animals with skin dehiscence did not have appropriate post-operative care. One of the orchiectomies had been performed through a scrotal approach which may have contributed to swelling and dehiscence. Death: One patient was euthanized after an unsuccessful attempt to treat post-operative complications. This was the only death that occurred as a result of an ovariohysterectomy or orchiectomy. The patient was in poor condition pre-operatively and the death was likely due to the pre-existing health of the dog. A necropsy was not performed.

Week 4. An owner presented a number of dogs for surgery. The owner lived more than a mile away from the surgery center up a long, steep slope. Only two of the dogs had body condition scores >2, one of which escaped and went running the following day.

All of the other animals which received post-operative visits recovered uneventfully without further intervention or care needed.

In conclusion, the majority of animals recovered well after surgery. The higher rate of skin dehiscence is most likely due to poor post-operative care.[5] Many of the animals presented for surgery were infested with fleas and ticks. These animals were likely positive for ehrlichiosis which made surgery and recovery more challenging owing to bleeding disorders caused by decreased platelet production thereby impairing adequate clotting.[6] Wound infection rates following similar surgeries performed in the United States typically range from 2.2% to 5.7%.[5] The rates of wound infections following ovariohysterectomy and orchiectomy found in this study were similar. The skin dehiscence rates were higher than those seen in the United States.[5] This is most likely due to the inadequate post-operative care provided by the owners. It is possible that although the surgeries were performed in field conditions, the population of animals has adapted to survive harsher environmental conditions than a similar population in the United States resulting in good surgical outcomes. Although this study concluded that the described conditions resulted in acceptable outcomes, World Vets' standard of care now includes a new sterile drape for each procedure and mandatory surgical cap and mask. In many cases volatile anesthetics and steam-sterilized instruments are now the standard.

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Appendix

Questionnaire/Survey

We are interested in knowing how your cat/dog has been doing since the surgery it received on [INSERT DATE]. This information will be helpful to our future efforts to provide spay and neutering for cats and dogs in your area.

Overall, how is your cat/dog doing? *[Enter respondent comments]*

Death	Yes	☐	No ☐	

[If the cat/dog has died, express your sympathy].

I do have just a few specific questions about what your cat/dog experienced in the days following the surgery that will be useful to our overall program.

Q1A. Was your cat/dog lethargic (or use a term/phrase that would be more common such as: "more tired than usual") 24 hours (or "about one day") after the surgery?

Q1B. Was your cat/dog lethargic 48 hours, or "about 2 days", after the surgery?

Q1C. Was your cat/dog lethargic 72 hours, or "about 3 days" after the surgery?

Attitude					
Lethargic	Yes	☐	No	☐	
	24 hrs post-op	☐	48 hrs post-op	☐	72 hrs post-op ☐

Q2A. How was your cat/dog's appetite 24 hours (or "about one day") after the surgery? Would you say good, fair, poor, or not at all?

Q2B. How was your cat/dog's appetite 48 hours (or "about 2 days") after the surgery? Would you say good, fair, poor, or not at all?

Q2C. How was your cat/dog's appetite 72 hours (or "about 3 days") after the surgery? Would you say good, fair, poor, or not at all?

Appetite					
None	24 hrs post-op	☐	48 hrs post-op	☐	72 hrs post-op ☐
Poor	24 hrs post-op	☐	48 hrs post-op	☐	72 hrs post-op ☐
Fair	24 hrs post-op	☐	48 hrs post-op	☐	72 hrs post-op ☐
Good	24 hrs post-op	☐	48 hrs post-op	☐	72 hrs post-op ☐

Q3A. Did your cat/dog lick or chew the incision 24 hours (or "about one day") after the surgery?

Q3B. Did your cat/dog lick or chew the incision 48 hours (or "about 2 days") after the surgery?

Q3C. Did your cat/dog lick or chew the incision 72 hours (or "about 3 days") after the surgery?

Licking/Chewing at incision					
Yes	24 hrs post-op	☐	48 hrs post-op	☐	72 hrs post-op ☐
No	24 hrs post-op	☐	48 hrs post-op	☐	72 hrs post-op ☐

We are also interested in knowing about other conditions your pet may be experiencing since the surgery. For each of the conditions I read, please tell me if the condition is very severe (5),moderately severe (4), moderately mild (3), very mild (2), or not at all (0).

Q4A. The first condition is redness, would you say your cat/dog's condition is very severe, moderately severe, moderately mild, very mild or not at all?

Q4B. The second condition is swelling, would you say your cat/dog's condition is very severe, moderately severe, moderately mild, very mild or not at all?

Q4C. The third condition is dehiscence [NEED TO DEFINE FOR RESPONDENT], would you say your cat/dog's condition is very severe, moderately severe, moderately mild, very mild or not at all?

Q4D. The fourth condition is discharge, would you say your cat/dog's condition is very severe, moderately severe, moderately mild, very mild or not at all?

Wound Assessment						
	None					Severe
Redness	0	1	2	3	4	5
Swelling	0	1	2	3	4	5
Dehiscence	0	1	2	3	4	5
Discharge	0	1	2	3	4	5
Total Score:						
Death	Yes ☐		No ☐			
Comments/ Observations:						

Body Condition Score								
1	1.5	2	2.5	3	3.5	4	4.5	5

Those are all the questions I have. Thank you for taking the time to talk with me today. Is there anything else you would like to tell with regard to your cat/dog's surgery and recovery? *[Enter respondent comments]*