OVE, OVH, OMG

A Pragmatic Review of Surgical Neutering Options
Sterilization vs Neutering

- Surgical Sterilization - prevent reproduction
- Neutering - removing the gonads
  - Prevents reproduction
  - Alters behavior
  - Alters disease risks

“IT’s not you, babe—I’ve been neutered.”
<table>
<thead>
<tr>
<th>Condition</th>
<th>How Common?</th>
<th>How Serious?</th>
<th>Effect of Spaying</th>
<th>Species Affected</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unwanted litters</td>
<td>Very Common</td>
<td>Very</td>
<td>Prevents</td>
<td>dog, cat</td>
<td>significant pet overpopulation and associated euthanasia</td>
</tr>
<tr>
<td>Risks of reproduction</td>
<td>Uncommon</td>
<td>Variable</td>
<td>Prevents</td>
<td>dog, cat</td>
<td>dystocia, brucellosis, diabetes, others; risk of dystocia can be high for certain breeds generally poor prognosis</td>
</tr>
<tr>
<td>Mammary neoplasia</td>
<td>Very Common</td>
<td>Very</td>
<td>Probably ↓</td>
<td>dog, cat</td>
<td></td>
</tr>
<tr>
<td>Pyometra</td>
<td>Very Common</td>
<td>Very</td>
<td>Prevents</td>
<td>dog, cat</td>
<td></td>
</tr>
<tr>
<td>Uterine neoplasia</td>
<td>Rare</td>
<td>Variable</td>
<td>Prevents</td>
<td>dog, cat</td>
<td>some benign/removable, some malignant</td>
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<tr>
<td>Ovarian neoplasia</td>
<td>Uncommon</td>
<td>Variable</td>
<td>Prevents</td>
<td>dog, cat</td>
<td></td>
</tr>
<tr>
<td>Vaginal/Vulvar neoplasia</td>
<td>Uncommon</td>
<td>Moderate</td>
<td>↓ dramatically</td>
<td>dog</td>
<td></td>
</tr>
<tr>
<td>Osteosarcoma</td>
<td>Uncommon</td>
<td>Very</td>
<td>Possibly ↑</td>
<td>dog</td>
<td>risk variable by breed</td>
</tr>
<tr>
<td>Hemangiosarcoma</td>
<td>Uncommon</td>
<td>Very</td>
<td>Probably ↑</td>
<td>dog</td>
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<tr>
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<td>Uncommon</td>
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<td>Possibly ↑</td>
<td>dog</td>
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</tr>
<tr>
<td>Mast Cell Neoplasia</td>
<td>Common</td>
<td>Moderate</td>
<td>Probably ↑</td>
<td>dog</td>
<td>risk variable by breed, often curable</td>
</tr>
<tr>
<td>Transitional cell carcinoma</td>
<td>Uncommon</td>
<td>Very</td>
<td>↑</td>
<td>dog</td>
<td>risk variable by breed</td>
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<tr>
<td>Cruciate ligament disease</td>
<td>Common</td>
<td>Moderate</td>
<td>↑</td>
<td>dog</td>
<td>risk variable by breed, surgically treatable</td>
</tr>
<tr>
<td>Hip dysplasia</td>
<td>Common</td>
<td>Moderate</td>
<td>Probably ↑</td>
<td>dog</td>
<td>risk variable by breed</td>
</tr>
<tr>
<td>Aggressive behavior</td>
<td>Common</td>
<td>Very</td>
<td>Possibly ↑</td>
<td>dog, cat</td>
<td></td>
</tr>
<tr>
<td>Urinary incontinence</td>
<td>Very Common</td>
<td>Mild</td>
<td>Possibly ↑</td>
<td>dog</td>
<td>medically controllable in 65-75% of cases</td>
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<tr>
<td>Urinary tract infection</td>
<td>Common</td>
<td>Mild</td>
<td>Possibly ↑</td>
<td>dog</td>
<td>easily treatable</td>
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<tr>
<td>Hypothyroidism</td>
<td>Uncommon</td>
<td>Moderate</td>
<td>Possibly ↑</td>
<td>dog</td>
<td>easily treatable</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>Uncommon</td>
<td>Very</td>
<td>Possibly ↑</td>
<td>dog, cat</td>
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<tr>
<td>Acute pancreatitis</td>
<td>Uncommon</td>
<td>Very</td>
<td>Possibly ↑</td>
<td>dog</td>
<td></td>
</tr>
<tr>
<td>Obesity</td>
<td>Common</td>
<td>Very</td>
<td>↑</td>
<td>dog, cat</td>
<td>easily prevented by calorie restriction</td>
</tr>
<tr>
<td>Longevity</td>
<td>--</td>
<td>--</td>
<td>Possibly ↑</td>
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<td>neutering influences causes of death</td>
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<td>Testicular neoplasia</td>
<td>Uncommon</td>
<td>Moderate</td>
<td>Prevents</td>
<td>dog</td>
<td>most benign and surgically removable</td>
</tr>
<tr>
<td>Prostate disease</td>
<td>Very Common</td>
<td>Variable</td>
<td>↓ dramatically</td>
<td>dog</td>
<td>some have few symptoms others have severe, chronic disease</td>
</tr>
<tr>
<td>Behavior problems</td>
<td>Common</td>
<td>Variable</td>
<td>Variable</td>
<td>dog, cat</td>
<td>conflicting studies; most report less aggression, roaming, urine marking</td>
</tr>
<tr>
<td>Perineal hernias</td>
<td>Uncommon</td>
<td>Moderate</td>
<td>↓</td>
<td>dog</td>
<td>can often be repaired surgically</td>
</tr>
<tr>
<td>Perianal fistulas</td>
<td>Uncommon</td>
<td>Moderate</td>
<td>↓</td>
<td>dog</td>
<td>incidence varies by breed, some respond well to treatment others are serious chronic problem</td>
</tr>
<tr>
<td>Prostatic neoplasia</td>
<td>Uncommon</td>
<td>Very</td>
<td>Probably ↑</td>
<td>dog</td>
<td>poor prognosis</td>
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<td>Common</td>
<td>Moderate</td>
<td>Probably ↑</td>
<td>dog</td>
<td>risk variable by breed, common in a few breeds</td>
</tr>
<tr>
<td>Femoral physeal fracture</td>
<td>Uncommon</td>
<td>Moderate</td>
<td>Possibly ↑</td>
<td>cat</td>
<td>obesity may be confounding factor</td>
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Spaying Females

- Ventral Midline OVH
  - Most common in the U.S.
  - Sterilization and neutering
  - Many variations
Spaying Females

• Ventral Midline OVH
  • Pros-
    • Effective for sterilization & neutering
    • Familiar
    • Economical

• Cons-
  • Complications
    • Highly variable- 7%-20%
    • Hemorrhage- 2%-79%
    • Incisional complications-
      • Trauma/Pain/Inflammation- 2%-74%
      • Infection- 2%-6%
      • Seroma- 2.5%- “quite common”
      • Dehiscence- < 1%
      • Herniation- ?%
Spaying Females

- Ventral Midline OVH

- Complications
  - Death - rare
  - Stump pyometra/Ovarian remnant - rare
  - Ureteral ligation - rare

- Variations - no comparative data
Spaying Females

- Flank OVH
  - Common outside the U.S. (96% of vets in one UK survey)
  - Cats and small dogs
    - Pros-
      - Effective for Sterilization & Neutering
      - Faster?
      - Safer?
    - Cons-
      - Access
      - Both ovaries
      - Uterus
      - Previously spayed
      - Anatomic anomalies
      - Dropped pedicle
      - Bilateral incisions (dogs)
      - More painful?
      - Less cosmetic?
Spaying Females

- Flank OVH
  - Complications
    - Hemorrhage (5% in dogs)
    - Incisional (22-39%)

- Midline vs Flank OVH
  - Comparative Studies (all cats)
    - Time
    - Pain
    - Complications

Coe, 2006
Burrow, 2006
Kiani, 2014
Oliveira, 2014
Spaying Females

- Coe, 2006
  - 66 cats randomized to midline or flank OVH
  - Students did surgery
  - No difference in
    - surgical time
    - owner assessment of pain
    - perceived or observed difficulty
    - owner satisfaction
    - overall complications
  - More frequent incisional discharge with flank
Spaying Females

- Burrow, 2006
  - 20 cats randomized to midline or flank OVH
  - One experienced surgeon
  - Midline took longer (13 min vs 11 min)
  - Flank group more painful but did not reach statistical significance
  - Complications not assessed
Spaying Females

- Kiani, 2014
  - 24 cats feral cats assigned to midline/flank, young/adult
  - Surgeons?
  - Midline took longer (30 min vs 24 min)
  - Pain was not assessed
  - Complications-
    - Overall more for midline (24% vs 7%)
    - Unusually high (e.g. dehiscence and infection occurred in 33% of midline cats)
Spaying Females

- Oliveira, 2014
  - 14 cats randomly assigned to midline/flank
  - One experienced surgeon
  - Fake sutures to “blind” assessors
  - No difference in surgical time (24 min midline vs 28 min flank)
  - Flank more painful
  - Complications not assessed
Spaying Females

• Comparisons
  • Time
    • No difference = 2
    • Midline longer = 2 (negligible difference)
  • Pain
    • No difference = 1
    • Flank more painful = 2 (only one statistically significant)
  • Complications
    • Midline more = 1 (but....)
Spaying Females

- Ovariectomy vs Ovariohysterectomy
  - OVE more popular outside of U.S. (changing?)
  - Equally effective?
  - Faster?
  - Less Painful?
  - Short-term complications
  - Long-term complications

- Comparative studies

Okkens, 1997
Peeters, 2011
Lee, 2013
Spaying Females

- Okkens, 1997
  - 135 dogs (69 OVE, 66 OVH)
  - Owner questionnaire 8-11 years after spay
  - No evidence of estrus or pyometra
  - No difference in urinary incontinence
  - Time not assessed
  - Pain not assessed
  - Short-term complications not assessed
Spaying Females

- Peeters, 2011
  - 40 dogs (20 OVE, 20 OVH)
  - Randomized prospective trial
  - One experienced surgeon
  - No difference in surgical time
  - No difference in pain scores
  - No difference in incisional complications
  - OVE incision shorter than OVH
Spaying Females

- Lee, 2013
  - 13 dogs (6 OVE, 7 OVH)
  - Randomized?
  - One experienced surgeon
  - OVE faster
  - OVE shorter incision
  - OVE less painful
  - No difference in cortisol, glucose
  - No complications for either
Spaying Females

- OVE vs OVH Comparisons
  - Time
    - No difference = 1
    - OVH longer = 1
  - Pain
    - No difference = 1
    - OVH more painful = 1
  - Complications
    - Rare, no differences
    - Equivalent efficacy (cats?)
    - Equivalent long-term complications
- Owner consent?
Spaying Females

- Laparoscopy vs Laparotomy
  - OVE or OVH done by both
  - Efficacy
  - Time
  - Pain
  - Complications
  - Costs
  - Logistics

- Comparative Studies
  - Many different techniques

Phypers, 2017 (review of 5 studies, OVE only, cats and dogs)
Case, 2015 (OVH vs L-OVH vs L-OVE, cats)
Davidson, 2004 (OVH vs L-OVH, dogs)
Spaying Females

- Phypers, 2017
  - OVE only
  - 3 cat studies, 2 dog studies
  - Laparoscopy took longer in most
    - Time highly variable (surgeon, technique)
  - Laparoscopy less painful 4/5 studies
  - No consistent difference in short-term complications
Spaying Females

- Case, 2015
  - 16 cats randomized to OVH, L-OVH, L-OVE
  - 2 experienced surgeons
  - Time
    - OVH = 21 min
    - L-OVE = 34 min
    - L-OVH = 52 min*
  - Pain less for laparoscopy by most measures
  - Minor complications greater for laparoscopy
Spaying Females

• Davidson, 2004
  • OVH vs L-OVH
  • 34 dogs (16 OVH, 18 L-OVH), randomized?
  • L-OVH one surgeon, OVH student
  • L-OVH took longer (120 min vs 69 min)
  • No difference in pain by most measures and at most times
  • Variable complications, no clear difference

“Surgical time and complication rates were greater [for L-OVH]; however, L-OVH postoperative pain scores were <= OVH scores.”
Spaying Females

- Laparoscopy vs Laparotomy
  - Great variability in techniques
  - Equivalent efficacy
  - Laparoscopy usually takes longer
  - Laparoscopy is probably less painful
  - No clear difference in short-term complications
  - Long-term complications likely equivalent

- Cost
- Logistics (equipment, training, etc.)
Spaying Females

• Hysterectomy
  • “ovary-sparing spay” or “partial spay”
  • Pros-
    • Effective sterilization
    • Reduces long-term risks from OVE
    • Urinary incontinence
    • Neoplasia?
    • Other? (orthopedic disease, behavior)
  • Cons-
    • Behavior
    • Long-term risks of being intact
      • Mammary neoplasia
      • Stump pyometra (cervical excision)
      • Ovarian/vaginal neoplasia
      • Other?
    • Surgical complications?

for a more normal life for a pet:
PARTIAL SPAY
(hysterectomy)
Spaying Females

- Hysterectomy vs OVE/OVH
  - Comparative Studies

NONE

for a more normal life for a pet:

**PARTIAL SPAY**

(hysterectomy)
Spaying Females

• Tubal Ligation
  • Pros-
    • Effective sterilization?
    • Time?
    • Cost?
    • Short-term complications?
    • Reduce long-term risks of OVE
  • Cons
    • Reproduction
    • Behavior
    • Long-term risks of being intact
      • Pyometra
      • Mammary neoplasia
      • Other
  • Comparative Studies
Sterilizing & Neutering Males

- Sterilization & Neutering
  - Open vs closed
  - Scrotal vs pre-scrotal incisions
  - Pinhole technique

- Complications
  - Hemorrhage
  - Incisional complications
  - Scrotal hematoma

- Sterilization Only
  - Vasectomy
Sterilizing & Neutering Males

- Open vs Closed Castration
  - Complications
    - Herniation
    - Infection
    - Hemorrhage
  - Pain

- Comparative Studies

Hamilton, 2014
Sterilizing & Neutering Males

- Hamilton, 2014
  - 73 dogs (34 open, 39 closed)
  - Experienced surgeons and students
  - More overall complications with Open (70% vs 46%)
    - No difference in major vs minor
    - No difference in pain
Sterilizing & Neutering Males

- Scrotal vs Pre-scrotal incisions
  - Complications
    - Herniation
    - Infection
    - Hemorrhage
  - Pain
- Comparative Studies

Woodruff, 2015
Sterilizing & Neutering Males

- Woodruff, 2015
  - 437 dogs randomly assigned (206 pre-scrotal, 231 scrotal)
  - Experienced surgeons
  - 2 different sites with some different outcomes
  - Complications
    - Pre-scrotal took longer (5 min vs 3.5 min)
    - No difference in pain
    - No difference in hemorrhage
    - No difference in swelling
    - Pre-scrotal led to more self-trauma
Sterilizing & Neutering Males

• Pinhole Castration
  • Percutaneous ligation of spermatic cord
• Pros-
  • Rapid
  • No incision
  • Inexpensive
  • Minimize anesthetic risk
• Cons
  • Efficacy?
  • Complications
    • Infection
  • Pain
• Comparative studies
  • Highly variable
  • Inconsistent findings
Sterilizing & Neutering Males

- Castrating Cats
  - Typically scrotal incisions
  - Lots of ligation techniques
  - Little research

- Comparative Studies

Oliveira, 2010

- 39 cats
- All scrotal incisions
- Ligatures
  - Suture
  - Figure-eight pedicle tie
  - Square knot pedicle tie
- Complications
  - Very few
  - Slightly more swelling with ligature
Sterilizing & Neutering Males

- Vasectomy
  - Pros-
    - Effective sterilization (though can be delayed)
    - Less invasive procedure
    - Reduces long-term risks of being intact
    - Population control in feral cats?
  - Cons-
    - Not neutered
      - Behavioral consequences
      - Medical consequences
  - Surgical vs laparoscopic
  - Many different techniques
  - Comparative studies

Mahalingam, 2009
Sterilizing & Neutering Males

- Mahalingam, 2009
  - 10 dogs randomly assigned
  - Laparoscopy vs open pre-scrotal castration
  - Time was not assessed
  - Pain was not assessed
  - Complications
    - Scrotal swelling all surgical cases
    - None in laparoscopy cases
General Conclusions

• Females
  • OVH Variations- little evidence for optimal practice
  • OVE vs OVH
    • Equally effective (cats?)
    • Marginal differences in time, complications
  • Laparoscopy vs Laparotomy
    • Laparoscopy slower, more expensive
    • Laparoscopy probably less painful
  • Hysterectomy
    • Effective sterilization, prevents pyometra
    • Other Pros/Cons of not being neutered
• Tubal Ligation
  • Effective sterilization
  • All other risks of not being neutered
General Conclusions

- Males
  - Castration
    - Open vs Closed
      - Not much evidence of difference
    - Scrotal vs Pre-scrotal Incisions
      - Not much evidence of difference
    - Pinhole
      - Quick, cheap
      - Efficacy? Complications?
  - Cats
    - Not much evidence comparing techniques
- Vasectomy
  - Effective sterilization
  - Pros/Cons of not being neutered
  - Laparoscopy vs Surgical?