



CE

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## KEY FACTS

- Dermoid sinuses occur in 5.3% of Rhodesian Ridgebacks and are thought to be hereditary in this breed.
- Dogs with dermoid sinuses extending to the dura mater may present with ataxia, posterior paresis, and other neurologic abnormalities associated with myelitis or encephalitis.
- If the sinus becomes infected, is draining or swollen, or is causing clinical manifestations, the lesion should be removed surgically.
- After surgery, most patients recover smoothly and heal normally.

# Dermoid Sinuses: Description, Diagnosis, and Treatment

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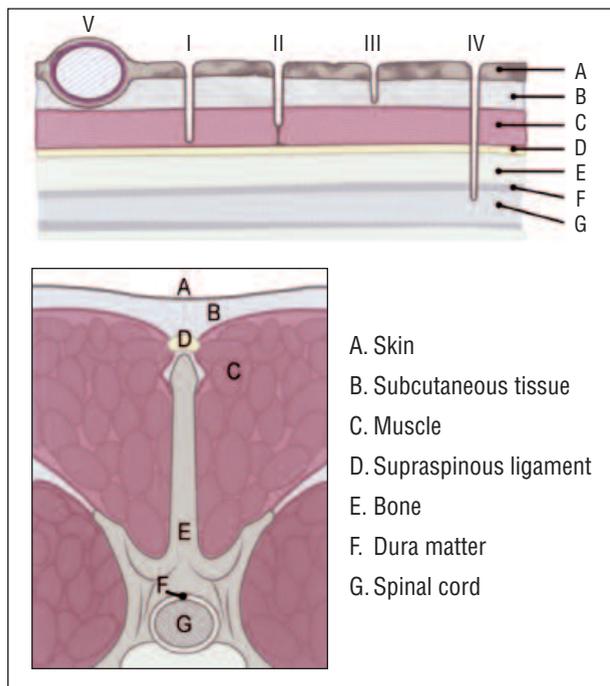
**ABSTRACT:** Dermoid (pilonidal) sinuses are defects of the dorsal midline skin that extend as blind sacs ventrally into the subcutaneous tissues. In some animals, these sinuses penetrate through the vertebral lamina and into the dura mater, predisposing the animal to infection and neurologic abnormalities. Treatment includes surgical resection and antibiotic therapy based on culture and sensitivity. Because this disease is considered inherited in Rhodesian Ridgebacks, affected animals should not be bred.

A dermoid sinus is a congenital defect in which the skin fails to separate completely from the ectodermal neural tube during embryonic development. Also called *pilonidal sinus* or *cyst* or *dermoid cyst*, the condition, which occurs most often in Rhodesian Ridgebacks<sup>1-10</sup> and Ridgeback-crosses,<sup>11</sup> is thought to be inherited.<sup>3</sup> Dermoid sinuses have been reported in several other breeds as well, including the shih tzu,<sup>12</sup> boxer,<sup>12</sup> Siberian husky,<sup>13</sup> chow chow,<sup>14</sup> American cocker spaniel,<sup>15</sup> Boerboel,<sup>16</sup> Yorkshire terrier,<sup>17</sup> English springer spaniel,<sup>18</sup> Great Pyrenees,<sup>19</sup> wire fox terrier,<sup>20</sup> and golden retriever.<sup>21</sup>

Located along the dorsal midline, these tubular blind sacs extend from the skin ventrally into the underlying tissues. In 1966, Mann and Stratton<sup>3</sup> described four types of dermoid sinuses based on the extent of penetration into the subcutaneous tissues (Figure 1):

- **Type I** extends ventrally as a cylindrical sac attached to the supraspinous ligament.
- **Type II** consists of a sac-like portion that is more superficial than that of type I and is attached to the ligament by a fibrous band.
- **Type III** is made up of a superficial sac with no attachment to the supraspinous ligament.
- **Type IV** extends to the spinal canal and is attached to the dura mater.

Since Mann and Stratton's report,<sup>3</sup> another type of dermoid sinus—**type V**—has been described as a true cyst consisting of a closed, epithelial-lined sac.<sup>10,14</sup>



**Figure 1**—Types of dermoid sinuses. (Illustrated by Jeffrey A. Leath)

### LOCATION

In Ridgebacks, dermoid sinuses are found most frequently in the cervical or craniothoracic regions but can also occur in the sacrococcygeal area or on the head. In this breed, sacrococcygeal dermoid sinuses are more likely to communicate with the dura than cervical sinuses.<sup>7</sup> Sinuses in Ridgebacks usually do not occur within the characteristic “ridge” of fur but rather cranial or caudal to the ridge. In other breeds in which this condition has been described, dermoid sinuses are most often found in the cranial thoracic region but have been reported in other regions of the body as well. Examples include a dermoid sinus of the head in an American cocker spaniel,<sup>15</sup> an intracranial dermoid sinus in a wire fox terrier,<sup>20</sup> and a dermoid sinus passing through the lumbosacral junction in an English springer spaniel.<sup>18</sup>

### PREVALENCE

In 1996, the Health and Genetics Committee of the Rhodesian Ridgeback Club of the United States (RRCUS) conducted a nationwide health survey of its members regarding diseases diagnosed in the breed between January 1, 1984, and July 15, 1996.<sup>22</sup> Results were obtained from 1,263 dogs owned by 278 RRCUS members and Ridgeback fanciers (48% response rate). The overall prevalence of dermoid sinuses in the surveyed population was 5.3% (67 dogs). Forty-one of the 67 dogs were euthanized because of the condition. This



**Figure 2**—A dermoid sinus can be felt as a tense band of tissue between the examiner's fingers during palpation. (Courtesy of Ms. Anke Terbruggen)



**Figure 3**—This dermoid sinus can be clearly visualized. (Courtesy of Ms. Anke Terbruggen)

high euthanasia rate most likely reflects culling of affected puppies by breeders because euthanasia usually occurred in puppies younger than 6 months of age. Dermoid sinuses were the second most common cause of death or euthanasia in the surveyed population. The total number of Ridgebacks euthanized because of dermoid sinuses (3.2% of the surveyed population) was greater than the death/euthanasia rate of Ridgebacks succumbing to vehicular trauma or gastric dilatation–volvulus.

### GROSS AND HISTOLOGIC APPEARANCE

Although sinuses may appear as indentations within the skin, enlargement may occur as a result of a foreign body type of reaction<sup>4</sup> or infection causing abscessation and drainage.<sup>16</sup> Histologically, the sinus most often contains keratin, sebum, and hair<sup>23</sup>; if infected, however, it may

contain inflammatory cells and bacteria.<sup>5,12,16,21</sup> The lining usually consists of a squamous epithelium with adnexal structures intact.<sup>16</sup> Dermoid sinuses, which consist of epidermal and dermal structures, may be distinguished histologically from meningocele or meningomyocele, which contain neural or meningeal elements.<sup>12</sup>

## PRESENTATION AND DIAGNOSIS

Most often, breeders or veterinarians detect dermoid sinuses in Ridgeback puppies during routine health screenings. The sinus feels like a tense band of tissue, 1 to 5 mm in diameter, when the skin is allowed to slip through the examiner's fingers<sup>7</sup> (Figure 2). In the cervical region, sinuses often extend to the dorsal spinous process of the second cervical vertebra.<sup>24</sup>

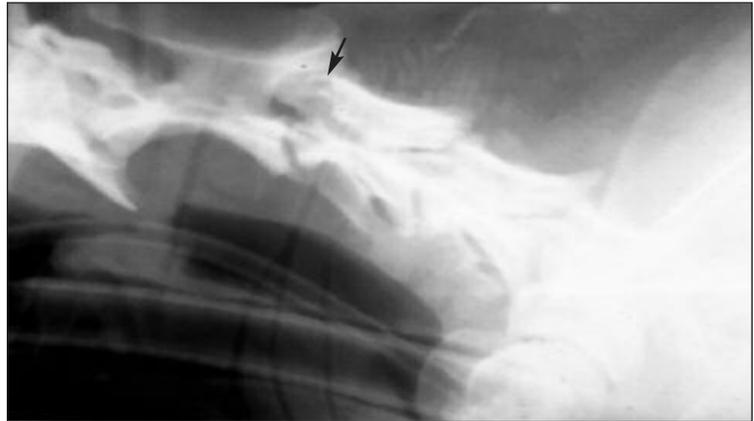
Sinuses are not always easy to detect, and it may be necessary to shave the area if the veterinarian or owner suspects that a sinus is present (Figure 3). Small openings on the skin surface filled with keratinaceous debris, inspissated sebum, and tufts of hair may be visible. Adult dogs with undiagnosed lesions may present with draining pyogranulomatous dermatitis if the sinus becomes infected and ruptures.<sup>14,21</sup> In some dogs, single or multiple nonpainful swellings that exhibit no drainage are evident along the dorsal midline.<sup>6</sup>

If the sinus communicates to the subarachnoid space via a defect in the lamina, neurologic abnormalities ranging from abnormal motor function to posterior paresis and hyperesthesia may be noted.<sup>5,12</sup> The presence and severity of neurologic signs depend on location of the lesion and presence or absence of myelitis or encephalitis secondary to sinus infection.

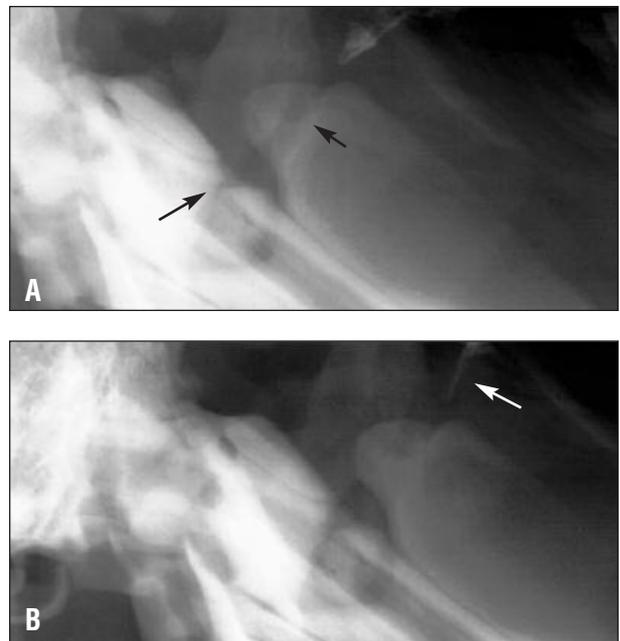
Survey radiographs of the spine may show a defect in the lamina if a lesion extends into the bone; radiographs may be normal if the sinus is limited to the skin. Diagnosis is confirmed, however, by a fistulogram in which a radiopaque, water-soluble, sterile contrast medium is infused via catheter or needle into the sinus opening<sup>25</sup> (Figure 4). Fistulogram results are often used to determine extent of the sinus and delineate the landmarks for surgery. If the sinus is filled with debris, its extent may not be evident on fistulography; in these cases, myelography may be helpful to identify communication with central nervous system structures (Figure 5). In rare cases, dermoid sinuses may be associated with spinal malformations, such as hemivertebrae, vertebral body fusions, and spina bifida-like lesions.<sup>12,17</sup>

## TREATMENT

Breeders often request euthanasia of affected Ridgeback puppies—whether or not the sinus is actually causing



**Figure 4**—Fistulogram of a dermoid sinus. Portions of the lamina of C-3 are absent cranially (arrow).



**Figure 5**—Myelogram (A) and fistulogram (B) of a dermoid sinus (arrows). Dorsal discontinuity of the contrast column is evident at the cranial extent of C-2. An osseous defect is also noted in the dorsal spinous process of C2, and positive contrast from the fistulogram as well as air are evident within the superficial portion of the dermoid sinus above the vertebral defect.

a clinical problem—because dermoid sinus is classified as a “serious defect or fault” by the RRCUS Code of Ethics.<sup>22</sup> Treatment may not be required if the sinus is not causing clinical problems and is not connected to the dura mater. If the sinus becomes infected, is draining or swollen, or is causing clinical manifestations, however, the lesion should be removed surgically.<sup>18,24,25</sup>

Some authors recommend a course of antibiotic therapy



Figure 6A—Surgical area

**Figure 6—**(A) With the patient in ventral recumbency, the area is prepared for surgery. (B) The surgeon dissects around the sinus carefully, demonstrating the fibrous band attaching the sinus to deeper structures. (C) The patient 7 days after surgery. (Courtesy of Ms. Anke Terbruggen)



Figure 6B—Removal of the sinus



Figure 6C—7 days after surgery

### Inheritance of Dermoid Sinus in Rhodesian Ridgebacks

The mode of inheritance of dermoid sinus in Rhodesian Ridgebacks has been a subject of debate for many years. In 1957, Lord et al<sup>5</sup> proposed that inheritance was due to a “gene complex,” noting that mode of inheritance could not be simple recessive because of the frequency of occurrence. Other proposed modes of inheritance include dominant with incomplete penetrance<sup>1</sup> and, perhaps the most popular, a simple recessive trait in which a phenotypically normal parent carries the recessive gene and passes it on to its offspring (i.e., variable expressivity).<sup>3,6,8</sup> At this time, no thorough studies have been performed to determine the exact mode of inheritance.

The South African ridged Hottentot dog is the common ancestor of both the Boerboel (boerhound) and Rhodesian Ridgeback.<sup>16</sup> Boerboels carry a ridge factor as some puppies are born with ridges. There is a likely association between inheritance of the ridge in these breeds and inheritance of the dermoid sinus.<sup>8</sup>

Currently, neutering affected dogs is recommended.<sup>3,4</sup> In 1964, Stratton<sup>7</sup> reported that a South African policy to cull affected Ridgebacks had “reduced the incidence of the condition.” If the trait is indeed autosomal recessive, however, complete eradication can be achieved only through breeding trials or identifying genetic markers.<sup>3</sup>

for several days to weeks before surgery to treat local infections.<sup>21</sup> Antibiotics should be chosen based on culture and sensitivity of samples obtained aseptically by aspiration of the deeper tissues. The most common isolates cultured from these lesions include *Staphylococcus intermedius* and *Enterococcus* spp.<sup>12,18</sup> First-generation cephalosporins or amoxicillin–clavulanic acid may be administered until culture results are available. If meningitis is suspected, a cerebrospinal fluid sample should be obtained and submitted for cytologic evaluation and culture.

The surgical area should be clipped and aseptically prepared with the patient in ventral recumbency (Figure 6A). An elliptic incision is made around the external opening of the sinus. Then the fibrotic wall is bluntly dissected to its origin (Figure 6B), and the attachments are freed carefully. Penetrating the sinus could contaminate the surgical field.<sup>18,24</sup> If the sinus extends down to the dura, a dorsal laminectomy or hemilaminectomy may be necessary to complete the resection.<sup>12,18,24</sup> Following sinus removal, the surgical site should be lavaged copiously with sterile saline. During closure, care should be taken to eliminate dead space by carefully reapposing all tissue layers, particularly the nuchal ligament if it has been tran-

sected during surgery.<sup>8,24</sup> Additionally, using a closed-suction drain may reduce seroma formation.

Neurologic deficits may worsen temporarily after surgery.<sup>18</sup> Despite a guarded prognosis, animals with neurologic signs often improve clinically or eventually return to normal activity after removal of the dermoid sinus.<sup>12,21,24</sup> Postoperative antibiotics are often continued if the surgeon suspects contamination or if the dura was involved. Postoperative pain may be controlled with NSAIDs or fentanyl patches placed preoperatively.<sup>26</sup>

Postoperative complications may include dehiscence, seroma, bacterial meningitis, or recurrence of signs resulting from incomplete excision. Most patients, however, recover smoothly and heal normally (Figure 6C).

### ACKNOWLEDGMENTS

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### ARTICLE #4 CE TEST

The article you have read qualifies for 1.5 contact hours of Continuing Education Credit from the Auburn University College of Veterinary Medicine. Choose the best answer to each of the following questions; then mark your answers on the postage-paid envelope inserted in *Compendium*.

- A type IV dermoid sinus ends
  - as a blind sac in the subcutaneous tissue.
  - as a fibrous band attached to the nuchal ligament.
  - as a blind sac attached to the nuchal ligament.
  - at the spinal canal attached to the dura mater.
- In Rhodesian Ridgebacks, dermoid sinuses are most frequently found in
  - the cervical region cranial to the dorsal fur ridge.
  - the thoracic region within the dorsal fur ridge.
  - the sacrococcygeal region.
  - or on the cranium.
- Dermoid sinuses that communicate with the dura mater are more likely to occur in the
  - characteristic ridge of fur.
  - cervical region.

- c. craniothoracic region.
  - d. sacrococcygeal region.
4. According to a survey of Rhodesian Ridgeback owners and breeders, the prevalence of dermoid sinus over a 12.5-year period in the breed was approximately
- a. 1%.
  - b. 3%.
  - c. 5%.
  - d. 7%.
5. Histologically, a dermoid sinus is lined with
- a. squamous epithelium and hair follicles.
  - b. meninges.
  - c. fibrous tissue.
  - d. mast cells.
6. The diagnosis of dermoid sinus is most often made by
- a. palpation and inspection.
  - b. survey spinal radiography.
  - c. fistulography.
  - d. myelography.
7. One of the most common bacteria cultured from dermoid sinuses is
- a. *Streptococcus* spp.
  - b. *Staphylococcus intermedius*.
  - c. *Micrococcus* spp.
  - d. *Actinomyces* spp.
8. Which statement regarding surgical resection of dermoid sinuses is true?
- a. The sinus should be opened and followed to its deepest extent to determine whether dura mater is attached.
  - b. Dorsal laminectomy or hemilaminectomy may be required for complete removal.
  - c. Transection of the nuchal ligament during sinus resection does not require primary repair.
  - d. both b and c
9. The mode of inheritance of dermoid sinuses is
- a. simple recessive.
  - b. simple dominant.
  - c. sex linked.
  - d. undetermined.
10. Which statement regarding dermoid sinuses is true?
- a. Affected dogs may have multiple sinuses that do not penetrate the skin.
  - b. Dermoid sinuses may predispose animals to hyperesthesia and posterior paresis.
  - c. Dermoid sinuses are the second most common cause of euthanasia in Rhodesian Ridgebacks.
  - d. all of the above