THE OLD AND NEW ABOUT AURAL HEMATOMAS
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Etiology
Aural hematomas in dogs have long been thought to result from self-trauma to the pinna secondary to an inflammatory condition related to the ear. Studies have shown that intrachondral rupture and hemorrhage occur in sections of tissue surrounding auricular hematomas and this supports a trauma-induced condition. Another researcher demonstrated serological and histopathological changes that were consistent with an immune-mediated condition. Certainly, in the experience of many surgeons, otitis externa is not a consistent feature associated with aural hematomas so, indeed, there may be more than one cause for this problem. An entirely reliable explanation for the etiology of aural hematomas is still elusive. *The inconsistent success rate of the numerous described techniques for treatment may be explained by the possible differences in the cause of the hematomas between individuals or by individual differences in the layer of tissue separation in the pinna.*

Anatomy of an Aural Hematoma
Some investigators have stated that aural hematomas develop between the skin and auricular cartilage on the concave surface of the pinna. The skin on the concave surface is tightly fixed to the perichondrium, leaving little space for hematomas to form. In dogs and humans, aural hematomas actually develop subperichondrally or intrachondrally, not subcutaneously. In rabbits, experimentally induced subcutaneous aural hematomas clot, organize, and resolve without scar formation. During the repair process of subperichondral or intrachondral hematomas, the clot organizes and is invaded by condroblasts from the perichondrium or fibroblasts from local connective tissue. These cells produce matrix and become chondrocytes or fibrocytes. Biopsy of aural hematomas in dogs and humans reveals chondrocytes and new cartilage during the healing. Condroblasts can be recognized at four days after formation of subchondral hematoma. Distortion of the pinna occurs because the auricular cartilage bends around the newly formed cartilage and fibrous tissue. *Further separation of the surfaces of the hematoma, from continual trauma or incomplete evacuation of the fluid or clots within the hematoma, causes more scar or cartilage formation.* A cauliflower deformity results from incomplete drainage or continual breakdown of bridging tissue within the hematoma.

When to Treat Aural Hematomas
Given the potential for chondrogenesis in aural hematomas, early removal or drainage of blood and clots is necessary to avoid disfiguring scar formation. Many years ago, delay in drainage was advocated because seepage of blood from the inner surfaces of the hematoma would be controlled, and it was felt that this would allow more complete removal of the clot (at this time the incision method was the most widely used technique and this approach made some sense). Delay in drainage sets up the pinna for active chondrogenesis and eventual deformity. In addition, delay in treatment of a small hematoma may cause hematoma expansion. *Consider drainage of the hematoma as early as practical, and maintain some form of drainage until fluid buildup ceases.* In addition, for
surfaces of the hematoma to heal without interruption, some form of protection from shear forces is important particularly in the first week to 10 days after injury.

Treatment Methods

Aural hematomas are the seventh most commonly treated surgical condition in general practice. Despite its frequent occurrence there is not one generally accepted technique advocated by small animal surgeons. This may be partially explained by the fact that, as of this time, one technique has not been shown to be routinely successful, or that many techniques result in some success. This condition has been treated by many surgical techniques including either longitudinal, elliptical, cruciform, or curvilinear “S” shaped incision on the inner aspect of the pinna overlying the hematoma. After evacuation of the hematoma, the deadspace remaining is compressed by using either mattress sutures, or various dressing techniques such as bandaging the ear over roll cotton on top of the head, or by suturing of radiographic film or foam pads on to the concave surface of the pinna. Other, less invasive techniques, have been described such as aspiration of the hematoma fluid, or the establishment of drainage with Penrose drains, teat cannulas, or, more recently with closed suction systems.

The author has noted when incising into aural hematomas and looking at the inner surfaces of the hematoma that blood seems to accumulate either subperichondrally or intrachondrally. Perichondrium has a rich supply of blood and cells for repair. Subperichondral hematomas seem to heal more readily in my experience when proper technique and patient aftercare are maintained. When hematomas occur within the pinna cartilage, there may be less available blood supply and healing cells to allow rapid healing. Delay in healing of hematomas may result in recurrence of fluid within the hematoma before adhesion occurs between surfaces. Recurrence stimulates more chondroplasia and fibroplasia. One method has been recommended that more consistently results in successful treatment of aural hematomas in humans without excessive scar formation. With this method, surgeons meticulously remove cartilage from the inner perichondrium, so the perichondrium lies closely to the opposite cartilage surface. Perhaps the difference in the success of treatment of what appear like two similar hematomas otherwise may lie in the level of separation of tissues within the pinna. This process of removing cartilage from the inner perichondrium is a long and detailed process and it is probably not practical for treatment of most aural hematomas small animals.

Perform a complete otoscopic examination before surgery and attempt to diagnose the otitis condition, if present. Push a 4x4 sponge into the vertical ear canal to catch any blood or serum from the hematoma as it is drained. If blood is allowed to drain into the ear canal and it is not removed, acute otitis externa often results.

Small hematomas considered acute (the hematoma is still fluctuant and not organized) may be treated in a number of ways. Some surgeons have had success with some form of drainage (Penrose, teat cannula, closed suction apparatus). Drains, regardless of type, should remain in place for a minimum of two weeks (3 weeks is my preference). If an inflammatory ear condition is present, I recommend a short course of prednisolone along with drainage of the hematoma. Oral prednisolone is prescribed at 2 mg/kg for 10 days and 1 mg/kg for another 10 days. In my experience, drainage techniques (versus incision methods), when successful, result in the most cosmetic and pliable pinna. This form of therapy is recommended when these are priority items for the
owner. Another method that I have used recently allows excellent drainage of the hematoma but also provides better protection from disruption of healing surfaces from shear forces than other minimally invasive drainage techniques (the Bakers Punch technique). I have had rare recurrences with this technique and the treated ear is soft with barely perceptible scars from the punch areas after healing. During general anesthesia, the pinna is prepared for aseptic surgery.

Be sure to clip hair from both surfaces of the pinna. A 3.5 mm or, in large dogs, a 5 mm punch is used to create holes in the inner surface of the pinna into the hematoma. Holes are made about 1-1.5 cm apart and are not made any closer than 1 cm from the pinna margin. Make sure all fluid and clots are evacuated from the hematoma. Use 4-0 monofilament nonabsorbable suture material with a cutting needle to tack the inner surfaces of the hematoma at each hole. Insert the needle through the hole and catch a bite of the cartilage only (not through the skin) on the opposite side of the hematoma. Bring the needle through the skin on the inner concave portion of the pinna and knot the suture so that the inner surface of the hematoma firmly contacts the outer surface.
The ear is aseptically bandaged over the top of the head or around a roll of cotton for 1-3 days.

Remove the bandage and determine if head shaking occurs. If it does, I prefer to keep the ear bandaged until suture removal in three weeks. A short Elizabethan collar is placed on all patients after any type of aural hematoma treatment.

When hematomas are firm and organized, the incision method is the only technique I have used with some success to reduce excessive scar formation and ear cartilage proliferation (cauliflower ear). This technique is recommended because the hematoma must be opened to fully remove the organized clot; otherwise, residual hematoma will promote chondrogenesis. One of the priorities of this surgery is to reduce pinna inflammation as much as possible so that the postoperative period is more comfortable for the patient and this reduces excessive head-shaking and self-trauma. Aseptically prepare both sides of the pinna as described above. An incision is made on the inner pinna surface over the hematoma oriented along the long axis of the pinna to avoid damaging the auricular vessels supplying blood to the pinna. The shape of the incision is not important but I do not recommend cruciate incisions because this may result in necrosis of the tips of the tissue points. Do not continue your incision any closer than 1 cm from the pinna margin to avoid scar or deformity. Carefully evacuate all fluid and clots. Instead of placing suture through and through the ear pinna, just catch the opposite cartilage only with your mattress sutures. Avoid picking up the outer skin because this increases irritation of the pinna and moist dermatitis may occur at suture exit sites. Stagger the mattress sutures (4-0 monofilament, nonabsorbable suture on a cutting needle) about 1.5 cm apart, no closer than 1 cm from the ear margin. Orient the sutures along the long axis of the ear to avoid
vascular compromise of the pinna tip. To make each horizontal suture, insert the needle through the inner skin traversing the hematoma and catch a good bite of cartilage from the opposite side. You can readily feel the needle bite the far cartilage without penetrating the far skin. Pass the needle across the hematoma and out about 1 cm from the entrance site to complete the horizontal mattress suture. I prefer to keep the ear treated in this fashion bandaged for at least the first 7-10 days after surgery. Apply a temporary bandage for the first 24 to 48 hours. When drainage ceases place a long-term bandage for the remainder of the time. Sutures are removed in three weeks.

**Treatment Failure**

Although most treatment techniques result in some success, failure of the surgery can usually be attributable to a few common problems. Hematoma recurrence, or excessive scarring after surgery is most often due to:

- Failure to treat the inflammatory ear condition following surgical treatment
- Failure to prepare the ear properly and to use aseptic technique, resulting in infection
- Failure to completely evacuate the hematoma
- Failure to ensure continual drainage from the pinna deadspace
- Failure to take adequate precautions against self-inflicted trauma or head shaking.
- Failure to treat with proper surgical technique

Whatever method you choose for aural hematoma treatment, success is more consistent if the surgeon avoids the common causes of failure listed above. Invariably, new techniques that promise consistent success will be described in future literature. If you have less than acceptable success with one technique be sure that any new technique you attempt incorporates most, if not all, treatment principles we discussed.