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EVIDENCE-BASED APPROACH TO TREATMENT OF VENTRICULAR ARRHYTHMIAS

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The management of ventricular arrhythmias is a complicated issue. A tremendous amount of controversy exists regarding when to treat, the best type of treatment and post – treatment monitoring. The following discussion has particular importance to the canine patient.

WHEN TO TREAT
The majority of ventricular antiarrhythmic medications have some degree of side effects, particularly proarrhythmias. Therefore treatment is not without risk. The following rules have been suggested by some clinicians. First, it would be logical that ventricular premature complexes (VPC) that lead to hemodynamic compromise should be treated. Additionally, the documentation of the R on T phenomenon in any patient, and the identification of sustained ventricular tachycardia in a patient with underlying heart disease should probably also be addressed. Some authors have suggested treatment if there are more than 10 VPCs in a row, evidence of bigeminy or trigeminy or a heart rate greater than 160. It should be noted that an increased risk of sudden death has not been directly related to any of these. Therefore, clinical evaluation of the animal and the status of cardiac disease probably are the most important factors in the decisions to treat.

WHAT TO TREAT WITH

Emergency Treatment
Lidocaine, a class 1B antiarrhythmic, is a short acting antiarrhythmic that can be administered in a bolus form (2.0 mg/kg IV). This bolus can be repeated up to three times if necessary. If conversion occurs in response to a bolus, an infusion of lidocaine (25-75 ug/kg/min) may be given. The response of the arrhythmia to Lidocaine can be quite dependent on serum potassium levels. Therefore, potassium serum levels should be monitored and maintained in the high normal range.

If the arrhythmia is unresponsive to Lidocaine at the appropriate dose with adequate serum potassium levels, Procainamide may be tried intravenously (5-15 mg/kg).

Alternatively, or in addition to these antiarrhythmics, administration of magnesium may be considered. Low myocardial levels of magnesium have been associated with the development of ventricular arrhythmias and certain cardiac drugs (example, diuretics) have been associated with the development of hypomagnesaemic states. Unfortunately, evaluation of myocardial levels of magnesium is difficult without a myocardial biopsy; serum levels are poorly reflective. Therefore, magnesium sulfate or magnesium chloride may be given (30 mg/kg ) if a hypomagnesaemic state is suspected.

Chronic Therapy
In cases where chronic therapy is indicated, several possibilities including oral Procainamide, Sotalol, Atenolol, Mexelitine or Amiodarone may be considered.

Sotalol - a combination beta blocker and potassium channel blocker may be given at 1.5-2.5 mg/kg orally twice a day. Sotalol is really excreted and would appear to have a fairly low proarrhythmic risk. Since it is a beta blocker, it may be reasonable to use a slightly lower dose (50% of dose) if myocardial dysfunction is present.

Procainamide- a class 1A antiarrhythmic may be given at a dose of 15-25 mg/kg orally three times a day. Procainamide would appear to have a higher proarrhythmic effect than Sotalol or Mexelitine and the effect of the drug on canine ventricular arrhythmias appears to also be less. However, some dogs appear to respond well to it.

Atenolol- A beta blocker has demonstrated efficacy for some arrhythmias. The proarrhythmic effect would appear to be less than Procainamide and in some cases in humans it has been shown to have beneficial effects on survival.

Mexelitine- Mexelitine is a class 1 antiarrhythmic with many similarities to lidocaine. It appears to have a lower proarrhythmic risk than Procainamide and higher efficacy. However in many cases it can cause nausea and loss of appetite. This side effect is less if given with food or if given at the low end of the dose (5-6 mg /kg orally twice a day).

Additional efficacy in some cases can be obtained by using it combimncaton with a beta blocker like atenolol or sotalol.

Monitoring
The high potential for a proarrhythmia effect associated with the administration of ventricular antiarrhythmics requires the use of careful monitoring when chronic therapy is considered. Although many veterinarians may be forced by economic limitations to assess treatment by evaluation of a 2-3 minute electrocardiogram, this is poorly sensitive technique for assessing response to therapy. The lack of an arrhythmia on a 2-3 minute electrocardiogram does not mean that the arrhythmia has resolved. Therefore, for ideal monitoring, a 24 hour Holter monitor should be performed before starting therapy and after 4-6 weeks of therapy. Since dogs with frequent ventricular ectopy can have up to an 85% day to day variation in VPC number, we generally do consider a true benefit form therapy unless there is at least an 80% reduction in VPC number.