Holter recording

This month Kieran Borgeat, Clinical Lead in Cardiology at Langford Vets presents notes on Holter recordings.

A Holter recording produces an ambulatory electrocardiogram (ECG) which is performed by a device attached temporarily to the thorax. In veterinary patients, this is most frequently performed in dogs, but horses, cats and other species have been monitored. Since Dr Jeff Holter’s original 38 kg device was developed in 1947, monitors have become smaller and lighter, now recording digital data on a storage card which is later analyzed using specialist computer software.

Indications

- Syncope or exertional dyspnoea
- Episodic weakness or collapse, or unexplained signs such as panting heavily for no apparent reason
- Unexplained echocardiographic evidence of cardiac remodelling
- Diagnosis of dilated cardiomyopathy in a breed considered at-risk for ventricular arrhythmias, such as the Boxer, Dobermann or Great Dane
- Assessing average heart rate in atrial fibrillation, outside of the hospital environment and during exercise
- Screening for cardiomyopathy in the Dobermann or Boxer prior to breeding
- Further evaluation of an incidentally detected arrhythmia to assess risk of clinical signs or sudden death
- Serial monitoring of response to antiarrhythmic treatment

Markers of risk

Holter variables are associated with a poor prognosis in dogs with arrhythmias and provide information that is not available using other diagnostic tools. In dogs with ventricular arrhythmias, the presence of runs of ventricular tachycardia and R-on-T phenomenon (Figure 1; top) are associated with an increased risk of cardiac death. In patients with atrial fibrillation, a high mean 24-hour heart rate is associated with a shorter survival time.

Decision making

Holters allow clinicians to make decisions on whether to treat a patient, based on a uniquely thorough knowledge of heart rate, rhythm and risk factors. If high-risk or symptomatic tachyarrhythmias are identified, treatment with antiarrhythmic drugs may be indicated. After starting treatment, a repeat Holter is recommended to assess response. Since all antiarrhythmic drugs can theoretically be pro-arrhythmic, at least one follow-up Holter should be performed, even in patients that have apparently responded well. It is worth pointing out that the day-to-day variability of ventricular arrhythmias has been estimated at up to 80% even without treatment. Owing to this, most cardiologists assess response to treatment based on a reduction in the complexity of arrhythmias, rather than frequency alone.

Alternatively, intermittent bradyarrhythmias may be detected (Figure 1; bottom). This may be an indication for pacemaker placement, as medical treatment is rarely effective.

Pitfalls

Even if a practice owns equipment and runs its own recording service, a Holter provides data on over 100,000 heartbeats in a 24-hour period. The complexity of this data and lack of evidence-based guidelines on antiarrhythmic treatment mean that all recordings should be interpreted by an experienced cardiologist. If a Holter does not detect an abnormality, the clinician cannot exclude an arrhythmic cause of clinical signs unless an episode is reported by an owner during Holter monitoring. In such cases, use of an implantable ECG loop recorder may be useful.

FIGURE 1: Strips of ECG from two Holters showing different pathological arrhythmias. Top: a short run of ventricular tachycardia from a dog with syncope. R-on-T phenomenon is identified by a lack of return to baseline between the wide and bizarre complexes (numbers seven to ten from the left). Bottom: a severely long pause identified during an episode of syncope and cyanosis with limb paddling in a Boxer dog. The pause (in red, followed by a slow ventricular escape rhythm) lasted for 39 seconds. Transvenous pacemaker implantation resolved clinical signs in this case.