PART 5
Recording and interpreting ECGs

15 • Approach to interpretation of the ECG recording

It is important to develop, and use, a routine when reading ECGs. Always read an ECG from its beginning, i.e. from left to right. When the ECG is difficult to read, start from the easiest part of the tracing that is recognisable, then continue reading (left to right) from that point.

It is important to not over-read or be too dependent on ECG findings. Since the ECG records only the electrical activity of the heart, it should be remembered that this limits the information that can be gained from it. It is often poorly related to the mechanical function of the heart and does not provide information about aetiology or severity of organic heart disease. A normal ECG does not necessarily infer that the heart is normal and, likewise, an abnormal ECG is not necessarily indicative of heart disease. Additionally, if the ECG is abnormal, it is important to determine what the clinical significance is, and if treatment is indicated or not.

There are essentially four steps in ECG interpretation: rate, rhythm, complex measurement and mean electrical axis (see page 61).

(1) To calculate the heart rate (given as beats per minute)

This should be fairly easy, as you have already examined the animal and determined the heart rate on auscultation. (?!)

The simplest method of calculating the rate from an ECG is to mark a 6-second strip of a representative part of the tracing. Count the number of complexes and multiply by 10. If the P wave rate and QRS–T complex rates differ, then record these separately.

A method for the mathematician

If there is not a 6-second strip or there is a short paroxysmal tachycardia, then the heart rate can be calculated from the P–P or R–R interval as follows. At a paper speed of 25 mm/sec there is 1500 mm per minute. Measure the distance, with a ruler, between two complexes (or count the number of small 1-mm boxes).

Heart rate (in beats per minute):

$$\text{HR (at 25 mm/sec)} = \frac{1500}{\text{R} - \text{R interval (mm)}}$$

At a paper speed of 50 mm/sec there is 3000 mm per minute, thus:

$$\text{HR (at 50 mm/sec)} = \frac{3000}{\text{R} - \text{R interval (mm)}}$$

(2) Determine the rhythm

Check if the complexes are complete, i.e. that there is a P wave for every QRS–T complex, and a QRS–T complex for every P wave.

Identifying parts of the ECG complex

In some instances it can be difficult to identify P waves, or it can be difficult to determine which are the P waves and which are the T waves (especially at fast heart rates).

Tips

- It is often useful to mark the position of each P wave and QRS–T complex. This can be done by placing a piece of paper below the ECG tracing and placing a mark for each P and QRS (Fig. 15.1). This can help to establish if there is a pattern, or if there are hidden complexes, and if a complex has occurred before or after it was due (or expected to occur).
- Since the heart must always repolarise (to be depolarised again) there must always be a T wave following every QRS complex.
- Using callipers, note the P–R interval and Q–T interval, for a run of beats, this will often reveal which deflection must be which – as the P–R and Q–T intervals will generally remain fairly constant. This method is most usefully performed on a stretch of ECG in which there is a variation in rate.

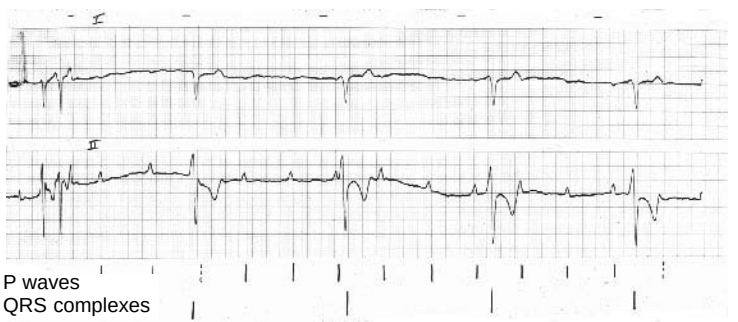

Figure 15.1 ECG demonstrating how to mark out P waves and QRS complexes to help identify complexes. Note that the dotted lines represent hidden P waves – note how the first one changes the shape of the ST segment compared with the others.

(3) Measure the complex amplitudes and intervals

This is usually performed on a lead II rhythm strip at 50 mm/sec (100 mm/sec on computer print-out units) and on an unfiltered section. At 50 mm/sec, 1 mm box = 0.02 seconds. Note the calibration.

Record the following (Fig. 15.2):

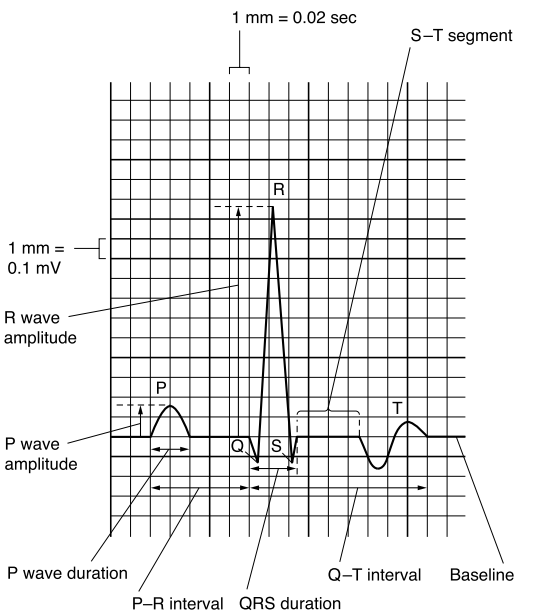

Figure 15.2 A schematic P–QRS–T complex (lead II) from a normal dog, illustrating the various amplitudes, durations and intervals (50 mm/sec and 10 mm/mV).

- P wave amplitude and duration
- R wave amplitude and QRS duration
- P–R interval – from start of P to start of QRS (strictly therefore a P–Q interval)
- Q–T interval – from start of QRS to end of T wave
- Note T wave morphology
- Note S–T segment elevation or depression

Use the table of normal values (Table 7.1, page 49) to check if the measurements are within normal values or not.