AN RS-T PATTERN ASSOCIATED WITH MYOCARDIAL INJURY

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Normally, the RS-T segment may lie above, on, or below the base line. When it begins above the base line, it frequently dips sharply toward the base line, then ascends with a downward convexity to meet the peak of an upward T (Fig. 1). The lowest point, or nadir, of the RS-T is nearer to the beginning of the RS-T than to the peak of the T. In addition, the peak of the T is taller than the initial elevation of the RS-T. It may be difficult to separate sharply the end of the QRS complex from the beginning of the RS-T because the end of R may be slurred or notched (Fig. 1B).

FIG. 1.—(A) Diagram of a normal, elevated RS-T segment. See text.
(B) An example of a normal elevated RS-T. Notice that the end of the R may be slurred or notched.

After myocardial injury, the RS-T segment not only becomes abnormally elevated (and depressed, depending on the lead taken), but it usually shows abnormal characteristics. Parkinson and Bedford (1928) have described the following three types of abnormal RS-T segments resulting from myocardial infarction.

(1) *The plateau RS-T* (Fig. 2A). Here, the RS-T segment begins above the base line, runs straight and horizontally, fuses with the T and descends gradually to the base line.

(2) *The dome-shaped RS-T* (Fig. 2B). Here, the RS-T segment begins above the base line and continues to rise with an upward convexity. As it begins to descend it fuses with the T.

FIG. 2.—Diagrams showing abnormal, elevated RS-T segments. See text.

(A) Plateau RS-T. (B) Dome-shaped RS-T. (C) Obliquely elevated RS-T. (D) Crescent RS-T. (E) Abnormal elevated RS-T with a normal downward convexity.

(3) In the third type, the RS-T segment begins above the base line and continues to rise obliquely like an inclined plane. At its summit it fuses with the T and descends to the base line (Fig. 2C). Parkinson and Bedford did not use any descriptive term for this RS-T pattern, which, however, can be called, *the obliquely elevated RS-T*.

FIG. 3.—(A) Elevated RS-T segments with normal downward convexities after myocardial injury. The tracing was taken a day after the infarct occurred.

(B) This was taken a week later. The RS-T segments are now dome-shaped.

The elevated RS-T segment may also show a normal downward convexity after myocardial injury (Fig. 2E and 3A). In such cases, when the RS-T is not markedly elevated and when

abnormal Q waves are not present, it may be very difficult to determine whether the elevated RS-T is normal or abnormal. For this reason, we decided to study examples of myocardial infarction and pericarditis that showed elevated RS-T segments with downward convexities to learn whether such elevated RS-T segments differed in any way from a normal elevated RS-T.

MATERIAL AND RESULTS

The electrocardiograms of 160 cases of acute myocardial injury were selected at random from our files. These included 75 cases of anterior infarction, 75 cases of posterior infarction, and 10 cases of pericarditis. In a majority of these cases multiple unipolar præcordial leads and augmented unipolar extremity leads had been taken in addition to the standard leads.

For control purposes, 50 normal tracings with elevated RS-T segments were selected at random.

One hundred and twenty-seven of the 160 tracings of myocardial injury showed characteristic plateau, dome-shaped, or obliquely elevated RS-T patterns (along with other electrocardiographic evidence of myocardial injury).

Thirty-three tracings showed an abnormal elevation of the RS-T with a downward convexity in one or more leads. In 20 of these cases the abnormally elevated RS-T was similar to a normally elevated RS-T except for the degree of elevation (compare Fig. 3A, with Fig. 1B).

Thirteen tracings showed an abnormal, elevated RS-T which differed in shape from the normal; this we have called a *crescent RS-T*. The crescent RS-T has the following characteristics: it begins above the base line, descends in a gentle slope and then turns and rises to merge with the peak of an upward T. The result is to form an inverted dome or a crescent (Fig. 2D). The lowest point or nadir of the RS-T is equidistant from the beginning of the RS-T and the peak of the T. It may be difficult to separate the first portion of the RS-T from the end of the QRS complex, which may be thickened or notched.

In those leads that show reciprocal depression of the RS-T, the depressed RS-T may show an upward convexity (Fig. 5, lead aVL).

These 13 tracings with a crescent RS-T included nine cases of posterior infarction, two cases of anterior infarction, and two cases of pericarditis. Examples of the crescent RS-T are shown in Fig. 4, 5, 6, and 7.

FIG. 4.—Crescent RS-T segments after myocardial injury from a case of posterior infarction. Leads II, III, and aVF are abnormally elevated. The crescent RS-T appears in leads II and aVF. Lead aVL shows slight reciprocal depression of the RS-T.

In Fig. 4, a case of posterior infarction, the crescent RS-T is seen in lead II and lead aVF.

In Fig. 5, a case of posterior infarction, the crescent RS-T is seen in lead III and lead aVF.

In Fig. 6, a case of pericarditis, the crescent RS-T is seen in lead aVF.

In Fig. 7B, a case of anterior infarction, the crescent RS-T is seen in lead I, lead aVL, and precordial leads V3 and V5.

FIG. 5.—Crescent RS-T segments after myocardial injury, viz. posterior infarction. Leads II, III, and aVF show elevated RS-T segments. Crescent RS-T segments appear in leads III and aVF. Leads I and aVL show reciprocal depression of the RS-T. Notice that the depressed RS-T segments show an upward convexity.

FIG. 6.—Crescent RS-T after myocardial injury, viz. pericarditis. Leads I, II, aVL, and aVF, and præcordia leads V4, V5, and V6 show elevated RS-T segments. Only lead aVF shows a crescent RS-T. Lead aVR shows reciprocal depression of the RS-T.

DISCUSSION

All our cases that showed a crescent RS-T also showed other electrocardiographic signs of myocardial injury such as plateau, dome-shaped or obliquely elevated RS-T segments in one or more leads or abnormal Q waves, or marked reciprocal depression of the RS-T in one or more leads, or elevation of the RS-T that was abnormal according to statistical criteria.

FIG. 7.—A case of anterior infarction.

(A) was taken a day after the infarct occurred. Lead I shows an abnormal Q and a plateau RS-T. Lead V4 shows an abnormal Q and a dome-shaped RS-T.

(B) was taken two days later. Crescent RS-T segments have appeared in leads I, aVL, and præcordial leads V3 and V5. Auricular fibrillation is now present.

None of our normal control cases showed a crescent RS-T. In order to check this further, we surveyed several hundred additional normal and abnormal tracings (excluding cases of myocardial injury), and were not able to find a crescent RS-T in any of this group. In this connection, a normal RS-T with a downward bowing should not be confused with a crescent RS-T. This might happen when a small R is associated with an upward T. Fig. 8, lead aVL, shows such an example. Notice that there is no elevation of the RS-T.

The downwardly convex and crescent elevation of the RS-T usually occurs in the early stages of myocardial injury, and as a deep, symmetrical T wave develops, the RS-T usually becomes dome-shaped (Fig. 3). However, the crescent RS-T may occur later than a dome-shaped or plateau or obliquely elevated RS-T.

FIG. 8.—A normal electrocardiogram. In lead aVL, the RS-T segment superficially resembles a crescent RS-T.

CONCLUSION

It has been known that when myocardial injury occurs, the RS-T segment not only becomes elevated (and depressed) but that the elevated RS-T shows characteristic patterns, namely, plateau-shaped, dome-shaped, and obliquely elevated. However, an elevated RS-T with a normal downward convexity can also occur after myocardial injury. When such an RS-T is not markedly elevated or when other electrocardiographic signs of myocardial injury are not present it may be difficult to differentiate such an RS-T from a normal RS-T.

Examination of such elevated RS-T segments has shown that in a percentage of these cases the elevated RS-T not only has a downward convexity, but shows a characteristic "crescent" shape that does not occur normally. Further studies may prove that the presence of a crescent RS-T is of value in the diagnosis of myocardial injury even in the absence of any other electrocardiographic signs of myocardial injury.

REFERENCES

- Parkinson, J. and Bedford, D. E. (1928). *Heart*, **14**, 195.