

SINGLE-STEP LIGATION OF ANTERIOR DESCENDING BRANCH OF LEFT CORONARY ARTERY FOR THE PRODUCTION OF DELAYED VENTRICULAR ARRHYTHMIAS—A MODIFIED TECHNIQUE

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The experimental model for the clinically observed ventricular ectopic activity accompanying myocardial infarction was devised by Harris (10) and has been used by numerous investigators for screening antiarrhythmic drugs (1, 11, 12, 14, 17). It consists of occlusion of the anterior descending branch of the left coronary artery under aseptic conditions. The ligation is carried out in two stages in order to prevent the loss of animal due to ventricular fibrillation. In the first stage, the artery is constricted but not completely occluded so as to permit the passage of some blood. In the second stage, after 30 min, the artery is completely and permanently occluded. Animals are studied in the unanaesthetized state 18-24 hr after the operation when they exhibit dissociation between atrial and ventricular activity with most of the beats of subatrial origin. However, this technique of 2-stage ligation under aseptic conditions has yielded a success rate of 30 to 60 per cent in our hands as well as in those of others (Personal communications from Arora and Singh). Hence this test-procedure has been modified in the present study in order to reduce the incidence of failures and if possible to dispense with the cumbersome aseptic precautions.

MODIFIED METHOD

Thirty mongrel dogs of both sexes weighing 9-14 kg were anaesthetized with pentobarbitone sodium (30 mg/kg iv). Steps of operation were the same in all essential details as those described by Harris (10) except for the following differences:

Occlusion of the anterior descending branch of the left coronary artery at a distance of 2-5 mm from the free margin of the left auricular appendage was carried out abruptly in one step by passing a single ligature underneath the freed artery and tying it. Aseptic precautions were not observed. However, the animal was given an intramuscular injection of procaine penicillin (400,000 U) before the operation or immediately after its completion.

RESULTS

Only 3 out of 30 animals died due to ventricular fibrillation which developed 2-8 min after the single-step ligation of the anterior descending branch of the left coronary artery. The remain-

ing animals survived the operation and were studied in the conscious state on the following days. Lead II of the electrocardiogram showed the presence of stable unifocal or multifocal ventricular arrhythmias on the first post-operative day, usually persisting on the second day and subsiding spontaneously on the third day. Similar time-course of ventricular ectopic activity has been reported by Harris (10) and other investigators (11, 12, 14).

Five animals were sacrificed on the sixth day and the hearts were removed for naked-eye and microscopic examination. The findings were similar to those reported by Harris (10) i.e. the evidence for infarction was present.

DISCUSSION

Harris (10) had devised the technique of ligating the anterior descending branch of the left coronary artery in two stages because of the previously reported (2, 13) high incidence of early ventricular fibrillation resulting from sudden coronary occlusion. The waiting period between the two ligations was considered to afford protection against ventricular fibrillation because of the development of collateral circulation during the 30 min period of partial occlusion (9). Although anastomotic channels between coronary arteries exist (4, 16), it has been reported that a longer period is required to register a significant increment in collateral circulation (3, 8). Hence development of coronary collateral vessels in a time as short as half an hr cannot be the factor involved in the prevention of anticipated high incidence of ventricular fibrillation in Harris's series of experiments. In fact, early mortality due to ventricular fibrillation following abrupt coronary occlusion is questionable (4). The present results indicate that early fatal fibrillatory episodes occurred in 10% of animals. A similarly low incidence of mortality has also been observed by other workers (5, 6, 7, 15). All the animals who survived the operation developed ventricular ectopic tachycardia on the first post-operative day.

In view of the above, it is suggested that, in place of two-stage ligation of the anterior descending branch of the left coronary artery for the production of delayed ventricular ectopic activity one-step coronary occlusion without aseptic precautions may be performed since it is almost equally free from the risk of causing early ventricular fibrillation. Further, this modified technique is less time-consuming and shortens the period during which the heart is handled and this may contribute to the greater over-all success of the experiment.

SUMMARY

In anaesthetized mongrel dogs, abrupt occlusion of the anterior descending branch of the coronary artery at a distance of 2 to 5 mm from the free margin of the left auricular appendage was carried out in one step. No aseptic precautions were observed but the animals were given procaine penicillin. Only 10% of the dogs died due to ventricular fibrillation within 8 min of ligation. The remaining animals studied in the conscious state on the first post-ligation day developed typical ventricular ectopic activity which subsided on the third day. Use of this comparatively simpler and less time-consuming occlusion method, in place of two-stage ligation tech-

nique of Harris under aseptic conditions, is suggested for studying the effect of drugs on ventricular rhythm disturbances accompanying myocardial infarction.

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