

not find a common procedure in the various American clinics I had the opportunity of visiting on my furlough in 1917-18. In three cases we added ligation to gastro-enterostomy without appreciable result one way or the other. The *value of gastro-enterostomy* has been shown in a recent post-operative investigation by Bulfour. This consisted in a comparison of the mortality in a given number of persons of certain age and social status in ordinary life, during a six-year period, with a similar number of persons upon whom gastro-enterostomy had been performed for gastric and duodenal ulcer. The result was, after the second year, actually in favour of those who had undergone operation for duodenal ulcer. The statistics were much less favourable in the gastric cases, the death-rate during three and-a-half years was three-and-two-thirds times the death-rate of the general population. The observation demonstrates the greater seriousness of gastric ulcer as compared with duodenal ulcer, a fact due most probably to the development of cancer on the site of gastric ulcer and is in favour of excision of the ulcer. Cancer, as is well known, is rarely super-imposed upon a duodenal ulcer.

Unfortunately the comparison cited above is at present impossible of repetition in India owing to the unreliability of mortality statistics and the impracticability of a reliable follow-up system.

Finally, I should like to add a word regarding *needless gastro-enterostomies*. I presume every surgeon of experience has on one or more occasions performed this operation without a clear indication as to its utility. A great many needless gastro-enterostomies have been performed, with the result that in not a few cases the patient's last condition was worse than the first. This was inevitable in the earlier days of inexperience in gastric surgery. To-day, however, in the light of present knowledge of living pathology, there is no valid excuse for this admitted error of judgment of former days. The necessary criterion for the operation is the presence on exposure of a visible or palpable ulcer, the history of which is compatible with the operative findings.

SOME OBSERVATIONS ON BLOOD PRESSURE DURING INTRAVENOUS INJECTION OF QUININE IN THE TREATMENT OF MALARIAL FEVER.

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In the *Indian Journal of Medical Research* for January 1919, McCarrison and Cornwall pointed out that all salts of quinine produce a profound fall of blood pressure in the sheep after intravenous injection. Many observers

have advocated the treatment of malarial fever with intravenous injection of concentrated solutions as a perfectly safe method of administering the alkaloid. Recently, this method was frequently used in the war in Mesopotamia and other places where troops were attacked with malaria.

So far as I am aware, there are no systematic records of observations on blood pressure in man during treatment with intravenous injection of quinine during an attack of malarial fever. My observations were made in the wards of the Campbell Hospital, Calcutta.

It may be pointed out here that during attacks of malarial fever the blood pressure is generally low, especially in the pernicious type of case. At the same time, it is in these latter cases that one looks to introducing quinine into the system in the shortest time, and therefore feels tempted to administer the drug by the intravenous method. If, at the same time, there is a profound fall of blood pressure during its administration, then the operation is dangerous and may even prove fatal. Cases of death following intravenous administration of quinine are rarely reported or are attributed to causes other than the operation itself. A recent author has attributed cases of sudden death in such cases to introduction of large doses of saline and considers that quinine should always be given in the concentrated form. (Alport.)

It is to determine the changes in blood pressure during intravenous injection of quinine in an attack of malarial fever that the following observations were made. The injections were generally given in the pyrexial period, except in one case.

I give here a summary of the observations made in each case:—

(1) Patient, Noimala, suffering from recurring quartan fever.

Temperature—normal at the time of injection.

Curve (1) shows that there was not much fall of blood pressure when quinine was given in a dose of 10 grains dissolved in 200 cc. of saline and at the rate of 10 cc. per minute.

Curve (2) also shows that there was very little change in the blood pressure when quinine was injected in a 10-grain dose dissolved in 200 cc.

Curve (3) shows that there was a sudden fall of blood pressure when quinine was injected in a 10-grain dose dissolved in 200 cc. in 3 minutes and 30 seconds.

Curve (4) shows that, immediately after injection of a concentrated solution in 15 seconds, the patient became pulseless for some seconds and there were muscular twitchings, the blood pressure rising to 70 after 2 minutes.

(2) Patient, Matidor, suffering from recurring attacks of benign tertian fever.

Temperature—normal at the time of injection.

Curve (1) shows that there was a drop of 12 mm. when quinine was injected in 20 seconds in a 9-grain dose dissolved in 20 cc.

Curve (2) shows that there was a drop of 12 mm. when quinine was injected in 30 seconds in a 9-grain dose dissolved in 20 cc.

Curve (3) shows that there was an apparent rise of blood pressure after the injection of quinine in a 9-grain dose dissolved in 20 cc. This was perhaps due to excitement (at any rate, this rise of blood pressure after injection of quinine was not noticed in any other case).

Curve (4) shows that there was a gradual fall of blood pressure, reaching its maximum in 30 minutes, when quinine was injected in 10 minutes in a 9-grain dose dissolved in 200 cc. The blood pressure remained for some hours 10 mm. lower than what it was before injection.

(3) Patient, Purna, suffering from recurring benign tertian fever.

Temperature—normal at the time of injection.

Curve (1) shows that there was not much fall of blood pressure when quinine was injected in 20 minutes in a 10-grain dose dissolved in 200 cc.

Curve (2) shows that there was a fall of 8 mm. when quinine was injected in 8 minutes in a 10-grain dose dissolved in 200 cc.

Curve (3) shows that the patient was pulseless for 10 seconds when quinine was injected in 25 seconds in a 6-grain dose dissolved in 20 cc. The blood pressure rose to 60 mm. one and-a-half minutes after the initial fall and then slowly rising to 80 mm.

(4) Patient, Lahasing, suffering from malignant tertian fever with crescents in the blood.

Temperature—103° F. when the first observation was made, 99°·6 when the second was made and 96°·4 when the third was made.

Curve (1) shows that there was a drop of 12 mm. when quinine was injected in 10 seconds in a 5-grain dose dissolved in 10 cc., the pressure rising almost to the original height six minutes after completion of the injection. (Injection given when temp. was 103° F.)

Curve (2) shows that there was a drop of nearly 20 mm. when quinine was injected in 15 seconds in a 10-grain dose dissolved in 20 cc. (Temp. 99°·6.)

Curve (3) shows that there was very slight fall of blood pressure when quinine was injected in 10 minutes in a 10-grain dose dissolved in 200 cc.

(5) Patient, Yakub, suffering from recurring quartan fever.

The curves show that there was a drop of 22 to 26 mm. when quinine was injected in a 10-grain dose in 15 to 20 seconds after being dissolved in 20 cc.

(6) Patient, Ascari, suffering from recurring benign tertian fever.

The curves show that there was a drop of nearly 10 to 30 mm. when quinine was injected

in a 10-grain dose in 15 to 25 seconds after being dissolved in 20 cc.

(7) Patient, Motilal, suffering from benign tertian infection.

Temp—normal at the time of injection.

The curves show that there was not much fall of blood pressure when quinine was injected in a 10-grain dose in 15 seconds after being dissolved in 20 cc. The patient, however, had muscular twitchings and hurried breathing immediately after injection.

CONCLUSIONS.

(1) Intravenous injection of quinine in concentrated solution (10 grains in 20 cc.) is generally followed by a fall in blood pressure and sometimes by a disappearance of the pulse for a few seconds.

(2) Intravenous injection of quinine in dilute solution (10 grains in 200 cc.) may be followed by a fall in blood pressure, but it is neither so sudden nor so great as in the case of concentrated solutions. In many cases there is no fall of blood pressure.

(3) The slower the injection is given, the less is the chance of fall of blood pressure taking place.

(4) The diminished blood pressure after intravenous injection of quinine, may persist for 12 hours or more after the injection.

(5) Intravenous injection of quinine should always be given in very dilute form (1 in 300). The injection must be given at the rate of 10 cc. every minute. It should never be lightly undertaken.

(6) Intravenous injection of quinine in concentrated solution may be followed by transient muscular twitchings and quickness of breathing.

(7) Intravenous injection of quinine should be given while making frequent careful blood pressure observations during the operation.

(8) As in malarial fever, especially of the pernicious type, the blood pressure is sometimes very low, intravenous injection of quinine should be given very slowly in a dilute form, guarded by administration of pituitrin or adrenalin and the application of tight bandages over the extremities.

If we take the above precautions, the dangers of intravenous injection of quinine will be reduced to a minimum.

NOTES ON FIELD AMBULANCE ORGANISATION.

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THE organisation of a Field Ambulance used to be in conformation with the older methods of warfare, but, under the conditions experienced in "Great War," a certain modification