Appearances of the stools after the introduction of blood into the caecum

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EDITORIAL SYNOPSIS   These experimental observations on patients in whom blood was introduced into the caecum at appendicectomy suggest that the rate of passage of the blood rather than the level of its insertion determines the colour of the stool.

In Great Britain a melaena stool is usually defined as a black, tarry stool. The appearance is thought to be due to haematin and perhaps other pigments resulting from the breakdown of haemoglobin (Harrison, 1957). It is usually considered to indicate bleeding from the upper alimentary tract (Abrahams, 1954) although melaena has been observed in bleeding from a carcinoma of the caecum (Avery Jones and Gummer, 1960).

Schiff, Stevens, Shapiro, and Goodman (1942) introduced blood into the stomachs of patients by tube and found that 100 to 200 ml. of blood was required to give a tarry stool and, after 1,000 ml., red blood could be passed in four hours and a tarry stool in 20 hours. Hilsman (1950) using a Miller-Abbott tube inserted 200 ml. of blood to varying levels of the small gut and observed the differences which occurred when the transit time of the blood was altered by the action of drugs. Their main conclusion was that the rate of passage of the blood rather than the level of its insertion determined the colour of the stool. They also inserted 200 ml. of blood at varying levels of the colon in six cases and suggested from these studies that a melaena stool was formed proximal to the ascending colon.

We were interested in whether a melaena stool or red blood could be produced experimentally by introducing blood into the caecum and in the factors determining the subsequent appearance of the stool.

MATERIAL AND METHODS

The blood was usually expired bank blood except in the case of smaller volumes when the patient's own blood was sometimes used. The blood was always seen to be red and was introduced into the caecum at appendicectomy for acute or chronic appendicitis. The appendix was mobilized and delivered into the wound, and subtotal appendicectomy performed, leaving about a ¼ in. stump. Blood was introduced into the caecum through a drip set or syringe attached to a Guest cannula inserted into the appendix stump. Even with the larger volumes the caecum was never distended. The appendix stump was excised and the operation completed as for routine appendicectomy. Volumes of blood introduced into the caecum of an individual patient varied between 25 and 400 ml. In some cases a solution of 1 g. of neomycin sulphate in sterile water was run in with the blood to study the effect of inhibiting bacterial action. The first two stools passed after operation were inspected by one of us, and if no red blood was seen the stool was tested by Occultest tablets in the routine way. Stools from 10 patients not given blood at appendicectomy were also studied as controls. Ether and water extracts from some of the stools not containing red blood were examined in a Hartridge spectroscope for haemoglobin, oxyhaemoglobin, and haematin pigments by the method described by Harrison (1957). There was no increase in postoperative morbidity in the patients studied.

RESULTS

It will be seen (Table I) that a melaena stool is passed only after 300 ml. or more of blood (in 56% of cases) and red blood after 200 ml. or more (21% of cases). Fifty per cent of the melaena stools were loose and 50% formed. When 100 ml. or more of blood was given one or more dark stools were passed.

Times, with ranges, from the insertion of the blood into the caecum until the passage of the stools, are shown in Table II. There is a significant difference in the average time between groups 5 and 6, 72 and 24 hours respectively (applying the t test, P < 0·001). Red blood was seen at later times after neomycin than when blood was inserted alone but the groups are too small to justify statistical analysis.

Two out of three patients given 400 ml. of blood

TABLE I

CORRELATION BETWEEN AMOUNTS OF BLOOD AND STOOL APPEARANCES

Amount of Blood Inserted (ml.)	No. of Cases	No. with Red Blood	Colour	Comment
400	19	5	10 melaena, rest dark	1 Fourteen melaena (both stools in seven cases, second only in four cases)
350	3	—	2 melaena, rest dark	2 Seven red blood (both stools in two cases, and always in first stool)
300	3	—	2 melaena, rest dark	
250	3	1	⎫ No melaena but	
200	6	1	⎬ one stool always	
150	1	—	⎭ dark	
100	5	—		
50	4	—	2 dark, rest normal	
25	5	—	1 dark, rest normal	
400 + Neomycin	9	5	Red-brown	Five red blood (after neomycin) (both stools in three cases, and always in first stool)
None (controls)	10	—	Normal	Tests for occult blood all negative except one positive in 70 seconds

TABLE II

TIMES FROM OPERATION TILL STOOL PASSED

Group	No. of Cases	Average Time to First Stool (hours)	Range (hours)
1 Control	10	65	31-104
2 Blood alone (25-400 ml.)	49	66	4-108
3 Blood alone (400 ml.)	19	60	4-94
4 Blood (400 ml.) + neomycin	9	44	30-70
5 Melaena[1]	14	72	30-94
6 Red blood[1]	7	24	4-36
7 Red blood/neomycin	5	41	30-56

[1] One case of red blood and melaena at 30 hours

with 1 g. of neomycin had melaena but in nine further patients in whom local neomycin was combined with an oral dosage of 1 g. six hourly for the first 48 hours after operation, no melaena stools were seen (Table I).

The results of spectroscopy are shown in Table III.

TABLE III

RESULTS OF SPECTROSCOPY

Group	Results
1 Nine cases melaena	Eight haemoglobin + haematin One haemoglobin
2 One 400 ml.	Haemoglobin + haematin
„ 250 ml.	Haemoglobin + haematin
„ 200 ml.	Haemoglobin + haematin
„ 100 ml. (no melaena)	Haemoglobin
3 Four cases 400 ml. + neomycin (no melaena)	All oxyhaemoglobin only

Values (to the nearest five seconds) of the more strongly positive Occultest result for each case studied are plotted (Fig. 1) against the amount of blood introduced. The result was less than 60 seconds for at least one of the stools in all patients given blood. There was a fair correlation between the Occultest results and the amount of blood inserted.
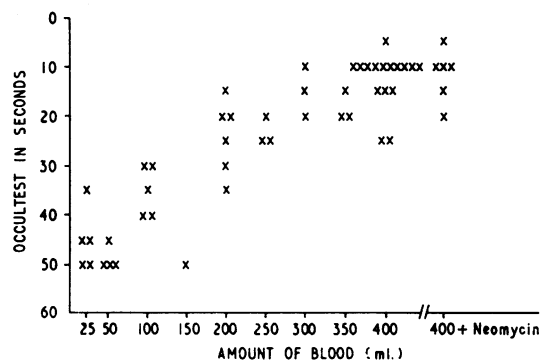

FIG. 1. *Correlation between volume of blood used and Occultest results.*

DISCUSSION

It is clear from the studies presented that the introduction of blood into the caecum can cause a melaena stool, a frankly bloody stool, or the appearance of the stool can be normal. A comparison of our findings and those of Schiff *et al.* (1942) shows that more blood is required to produce a melaena stool when blood is introduced into the caecum than into the stomach whereas less is required to produce a bloody stool. The findings in Table II support the conclusion of Hillsman (1950) that the rate of passage of the blood rather than the level of its insertion determines the colour of the stool.

After neomycin, neither a melaena stool nor haematin was observed, and red blood was seen at later times. These findings suggest that bacterial action is important for the breakdown of haemoglobin in the caecum.

It is interesting that in the experimental conditions we used, caecal blood did not appear to cause earlier defaecation than occurred in the control

group. Where spontaneous caecal bleeding occurs, however, the transit time for the blood might well be less as the colon would not be subjected to surgical trauma and to an anaesthetic. In practice when there is bleeding from the caecum a melaena stool is seldom observed, presumably because of the time and the relatively large volume of blood required to produce it.

We are grateful to Mr. A. A. Bonar, Mr. W. Beattie, Mr. W. Patrick, and Mr. C. J. Longland for allowing us to study patients in their wards.

Our thanks are also due to Professor E. M. McGirr for criticism and advice.

We are indebted to Dr. G. W. McNicol, of the Department of Biochemistry, Glasgow Royal Infirmary, who carried out the spectroscopic examinations.

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