

7-1-1967

Preliminary Report on the Error of Blood Volume Determination in Splenomegaly

Somneuk Gierasate

Vichai Poshyachinda

Follow this and additional works at: <https://digital.car.chula.ac.th/clmjournal>



Part of the [Medicine and Health Sciences Commons](#)

Recommended Citation

Gierasate, Somneuk and Poshyachinda, Vichai (1967) "Preliminary Report on the Error of Blood Volume Determination in Splenomegaly," *Chulalongkorn Medical Journal*: Vol. 12: Iss. 3, Article 4.

DOI: 10.58837/CHULA.CMJ.12.3.4

Available at: <https://digital.car.chula.ac.th/clmjournal/vol12/iss3/4>

This Article is brought to you for free and open access by the Chulalongkorn Journal Online (CUJO) at Chula Digital Collections. It has been accepted for inclusion in Chulalongkorn Medical Journal by an authorized editor of Chula Digital Collections. For more information, please contact ChulaDC@car.chula.ac.th.

PRELIMINARY REPORT ON THE ERROR OF BLOOD VOLUME DETERMINATION IN SPLENOMEGALY

Somneuk Gierasate. *
Vichai Poshyachinda. *

This report is an attempt to justify the accuracy of blood volume determination by radioactive chromium labeled red blood cells method (^{51}Cr -RBC) in patients with splenomegaly from various etiology, when blood sample was drawn from arm vein between 10-20 minutes after intravenous injection of the tracer.

Material and Method.

The studies were performed in 13 patients who had splenomegaly from the following etiology :

Diagnosis	Case No.
Banti's disease	1,2,3,4.
Hemoglobinopathies	5,6.
Infectious hepatitis	7.
Cirrhosis of the liver	8.
Splenic tumour	9.
Obstructive jaundice of unknown origin	10,11.
Hepatosplenomegaly of unknown origin	12,13.

15-30 uCi of ^{51}Cr -RBC (1) were injected intravenously. 3 ml of splenic blood from splenic puncture and 6 ml of venous blood from arm vein were taken simultaneously about 10-15 minutes after injection. Heparinized tube was used for collecting blood samples. 3 ml of blood hemolysed with saponin was taken from each sample for radioactivity counting. Duplicated Wintrobe's hematocrit were done for each blood sample. The average value was corrected for trapped plasma (2).

The radioactivity in the blood samples were measured in a well type NaI (TI) crystal (size 2" x 2") and using IDL amplifier, high voltage and scaler assembly (Serial No. 1830, 1820, 1800). All sample were counted to a total of at least 5,000 counts.

* Section of Radioisotope, Department of Radiology, Chulalongkorn Hospital Medical School.

RESULT.**TABLE I**

Case No.	Age	Sex	Wt. kgs.	Sampling Time minute	⁵¹ Cr Activity in Blood		Haematocrit corrected for Trapped Plasma.	
					Venous counts/min.	Splenic counts/min.	Venous %	Splenic %
1	34	M	61.8	18	1612	1230	31.9	—
2	57	M	45	15	1022	701	32.26	—
3	42	F	42	15	2058	1858	34.57	—
4	31	M	66.5	15	970	731	24.23	—
5	67	M	56.6	20	7185	4667	14.6	—
6	12	F	22.5	15	4019	4165	35.39	—
7	19	M	53	15	1913	2139	39.32	—
8	32	M	52.5	27	1874	1584	36.34	36.0
9	56	F	37.2	90	3528	4145	34.14	36.7
10	37	F	49	15	2274	2129	29.12	—
11	40	M	62	15	1534	1660	28.3	—
12	32	M	48	15	762	939	37.17	—
13	33	M	64	34	1541	924	36.31	37.19

TABLE II

No	Spleen Size* (cm.)	RESULTS OF PERCUTANEOUS SPLENIC PORTOGRAM.
1	8 x 18	Evidence of portal hypertension and collateral reflux.
2	7 x 21	Evidence of portal hypertension and collateral reflux,
3	10 x 21	Portal obstruction and collateral reflux.
4	18 x 12	Marked decrease visualization of intrahepatic tributaries of Portal Vein.
5	—	Unsatisfactory.
6	—	Unsatisfactory.
7	6 x 12	Portal hypertension and collateral reflux.
8	—	Portal obstruction or thrombosis.
9	10 x 16	No abnormal finding in the vasculature.
10	5 x 14	Decrease visualization of intrahepatic tributaries of Portal Vein.
11	8 x 20	Marked portal hypertension and collateral reflux and decrease visualization of intrahepatic tributaries of Portal Vein.
12	—	Marked tortuous collateral circulations, marked decrease visualization of intrahepatic tributaries of Portal Vein.
13	—	Splenic Vein thrombosis.

*The spleen size was estimated from splenic portogram.

Discussion

The significant difference between venous and splenic blood concentration of radioactivity can be expressed statistically as 0.25 ± 0.20 (3). The cause of delayed equilibration in the spleen does not seem to be related to the size of the varieties of the pathology in the spleen itself as shown in case No. 3 and 4.

The difficulty in collecting sufficient amount of splenic blood prevent definite conclusion on the comparison of hematocrit value between venous and splenic sample. There seems to be no definite difference between venous hematocrit and splenic blood as seen in case No. 8, 9, and 13. This evidence suggested that there is no pooling of red cell in the spleen, so the other possibility of delayed mixing might be stasis.

Since the blood volume determination by dilution technique rely mainly on perfect equilibration of tracer in the system, the finding that show high probability of imperfect equilibration suggests high inaccuracy in the determination. Further study in large series

of patients need to be done to establish an average equilibration time in splenomegaly.

Summary

The incomplete equilibration within the circulatory system in 15 minutes following intravenous injection of ^{51}Cr -RBC is shown in the result. This finding demonstrate high inaccuracy of blood volume determination in patients with splenomegaly if performed routinely without consideration of prolonged equilibration time.

REFERENCES

1. -Wasanasomsihi, M., Poshyachinda, V., Gierasate, S., Double tracer study. in hematologic disorders. The Thai J. of Radiol. Vol 3, No. 2, 1965.
2. -Veall, N. and Vetter, H. Radioisotope techniques in clinical research and diagnosis. p. 231, 1958.
3. -Croxtan, F.E. Elementary statistics with application in medicine and the biological sciences. p. 241 1953.