

ON CORRELATIONS BETWEEN PORTAL VENOUS PRESSURE AND THE SIZE AND EXTENT OF ESOPHAGEAL VARICES IN PORTAL CIRRHOSIS*

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IT IS A COMMON observation that patients with the most severe cirrhosis do not necessarily have the largest or most extensive esophageal varices. Often liver biopsy reveals poor correlation between hepatic lobular regeneration—the probable anatomic basis for intrahepatic portal block²—and severity of varices. Furthermore, clinical evidences of portal hypertension, such as splenomegaly and distended superficial abdominal veins, are not useful for prediction of the presence or severity of varices in the cirrhotic patient.¹ It is possible that these discrepancies may be explained on the basis of individual variations in the native submucosal venous anatomy of the cardia and esophagus.

Narrowing the discussion to correlations between portal pressure levels and the size of venous collateral channels within the esophagus, one recognizes several important clinical questions. How valid an estimation of the degree of portal hypertension can be derived from inspection of esophageal varices? Do enlarging varices indicate increasing portal pressure, or merely progressive accommodation of the collateral veins to a static head of pressure? Does the degree of diminution of varices following surgical portal decompression parallel the degree of decompression achieved? Does detection of varices of similar size and extent in different patients in-

dicate that the levels of portal hypertension are comparable?

To investigate these matters, esophagoscopic measurements of varix diameter and the extent of esophageal involvement were compared with simultaneous transesophagoscopic measurements of portal venous pressure. This report includes studies made on patients who were examined on at least two occasions, regardless of time intervals or intervening surgical portal decompression, so that the effects of changing portal pressure could be observed.

MATERIAL AND METHODS

Twenty-five patients with esophageal varices secondary to portal cirrhosis, proved by liver biopsy, were utilized. Patients with extrahepatic portal block were not included. Fourteen had some type of operation designed to reduce portal pressure during the period of study. Because following more than 30 successful portacaval shunts, varices have been observed esophagoscopically to disappear within a few weeks, even upon Valsalva maneuver, it was known that varices do not remain passively enlarged through flaccid dilatation following sudden reduction of portal hypertension.

The observations were based on personal esophagoscopic study with an instrument (Eder-Hufford) fitted with a telescope which furnishes four-diameter magnification. All examinations were made in

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the morning after the patients had fasted. The extent of the esophagus involved by varices was found by the usual rather precise method of measuring the portion of the instrument extending beyond the alveolar ridge.

The "severity," or diameter, of the venous channels is more difficult to evaluate, because diameter varies from point to

2. *Moderate.* Three to six millimeters.
3. *Mild.* Less than three millimeters.

By these criteria, varix configuration, occurrence of an occasional large varix among many small ones, and presence of dangerous complications, such as esophagitis or hiatus hernia, are not considered.

Portal pressure was measured transesophagoscopically by needle puncture.³ Re-

TABLE I. *Extent of Esophageal Involvement, Severity of Varices, and Portal Venous Pressure (cm. Water): Serial Studies, 25 Patients.*

Patient	1st exam.	2nd exam.	3rd exam.	4th exam.
1.....	100% sev. 45	1/3 mod. 20	1/2 mod. 22	
2.....	1/2 mild 13	2/3 mod. 35	2/3 mod. 29	
3.....	100% sev. 29	100% sev. 38	100% sev. 39	100% sev. 48
4.....	100% sev. 47	100% mod. 23	100% mod. 24	
5.....	1/2 mild 21	1/2 mild 27		
6.....	1/2 mod. 36	1/2 mild 8	1/2 mild 11	1/2 mild 18
7.....	100% sev. 43	2/3 mild 10		
8.....	2/3 sev. 43	1/2 mod. 22		
9.....	1/2 mod. 26	1/2 mild 14		
10.....	1/2 mod. 28	1/2 mod. 22		
11.....	1/2 sev. 34	1/2 mild 17		
12.....	1/2 mod. 33	1/2 mod. 18		
13.....	2/3 sev. 47	1/2 mod. 28	1/2 mild 17	
14.....	2/3 sev. 47	1/2 mod. 28		
15.....	2/3 mod. 32	2/3 mod. 33		
16.....	1/2 mod. 16	1/2 mod. 16		
17.....	1/2 mod. 34	1/2 mod. 38		
18.....	1/2 mod. 45	1/2 mod. 46		
19.....	1/2 mod. 34	1/2 mild 22		
20.....	100% sev. 29	100% sev. 30		
21.....	2/3 sev. 34	2/3 sev. 38		
22.....	1/2 sev. 35	1/2 mild 17		
23.....	1/2 mod. 30	1/2 mild 89		
24.....	100% sev. 41	1/2 sev. 24		
25.....	1/2 mod. 34	1/2 mod. 24		

point along the course of a varix and because varices of different sizes are often found. A single very large varix occasionally keeps company with many small ones. A simple ruler was fashioned for precise transesophagoscopy measurement of varix diameter (Fig. 1). From measurements taken at many examinations, an arbitrary classification was devised. It quickly became evident that only falsely precise and unrealistic results were to be had by setting up more than three categories:

1. *Severe.* In the esophageal segment most severely involved, most of the varices measure six or more millimeters in diameter.

cently the needle has been improved by opening its lumen laterally for a distance of 5 mm. from its tip (Fig. 1). Because by this technic it is easy to obtain a pressure reading, but difficult to obtain one which, beyond reasonable doubt, is valid, only a portion of patients so tested could be included in this report. It is believed that all of the pressure figures recorded here are true ones.

RESULTS

Table I presents the pertinent data, and the results are written therein. In Table II, the data are arranged to bring out the

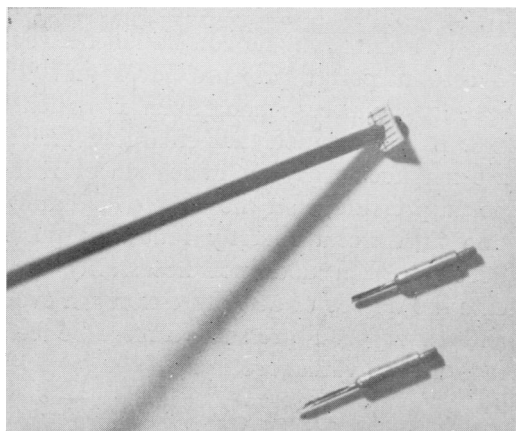


FIG. 1. The ruler, which is white and calibrated in millimeters, can be passed through the esophagoscope. When laid against a varix and viewed under the four-diameter magnification of the Eder-Hufford esophagoscope's swinging telescope, the ruler permits precise measurement of diameter. The two needles, used to pierce varices for measurement of portal pressure, have recently been altered by opening their lumens laterally.

proven feasibility and effectiveness. Technical matters, however, have far outstripped understanding of portal venous physiology and, in particular, of the natural history of esophageal varices. Routine utilization of endoscopic methods for study of varices has revealed that such lesions occur in situations which are unexpected and puzzling to those who have been used to relying on radiologic methods for their demonstration. Although the radiologically detectable varix has been recognized as

TABLE II. Group Correlations Between Varix Severity and Extent of Involvement, and Portal Pressure (cm. water).

Severity	Extent	No. instances encountered	Portal pressures	
			Extremes	Average
Severe.....	100%	10	29-48	39
	$\frac{3}{4}$	5	34-47	42
	$\frac{1}{2}$	1	35	35
	$\frac{1}{4}$	2	24-34	29
Moderate.....	100%	2	23-24	24
	$\frac{3}{4}$	4	29-35	32
	$\frac{1}{2}$	9	20-38	30
	$\frac{1}{4}$	7	16-46	31
	$\frac{3}{8}$	4	16-34	24
Mild.....	$\frac{3}{4}$	1	22	22
	$\frac{1}{2}$	2	21-27	24
	$\frac{1}{4}$	6	9-18	15
	$\frac{3}{8}$	1	22	22
	$\frac{1}{8}$	3	8-13	11

group relationships between portal pressure and varix severity.

It was found that in individual patients, the parallelism between varix appearance and portal pressure from one examination to the next was not close. In no instance, however, had the varices become smaller if the pressure had risen, nor larger if the pressure had fallen. There were rather marked pressure changes in some instances in which the lesions remained unchanged.

Although the level of portal pressure appeared to have exerted a degree of influence over the varices in individual patients, it was clear that a certain pressure level had produced varices of quite different size and extent in different patients. Table II shows that even the averages of the pressure readings found in each category form only a rough pattern of progressive severity.

COMMENT

Surgical technics for portal decompression have been developed to the point of

comfortably large and rather static from one examination to the next, a note of uncertainty has been added to the accepted classical theme by esophagosopic demonstration that all clinically important varices are not large, nor are they necessarily static. Development of a method for measuring the venous pressure within varices has added one more factor to be considered in answering the question of how varices behave and what the explanatory mechanisms are.

Uncertainties surrounding the natural history of esophageal varices are so serious that they threaten to vitiate some of the progress already made in surgical por-

tal decompression. The results of the present study add only a small amount of information to the large problem. Now most pressing is information relative to spontaneous alterations in varix size, correlations between progressive liver disease and varix severity, and influence of the level of portal pressure on spontaneous hemorrhage.

SUMMARY AND CONCLUSIONS

1. Twenty-five patients with proved portal cirrhosis and esophageal varices were examined serially by esophagoscopy, and measurements were made of varix diameter, extent of esophageal involvement, and portal venous pressure.

2. It was found that (a) there was not close correlation between changes in portal pressure and changes in varix severity among individual patients; however, varices did not become smaller if the pressure

increased, nor larger if the pressure fell, and (b) there was no correlation between a certain portal pressure level and the severity of varices among different patients.

3. It is concluded that enlarging varices are not necessarily an indication of rising portal pressure, that the degree of diminution in variceal severity following portal decompression does not necessarily indicate the degree of decompression achieved, and that portal pressure cannot be estimated from varix severity.

BIBLIOGRAPHY

- ¹ Brick, I. B., and E. D. Palmer: Incidence of Esophageal Varices in Cirrhosis of the Liver: an Esophagoscopy Study with Correlation of Clinical and X-ray Findings. *Gastroenterology*, in press.
- ² Kelty, R. H., A. H. Baggenstoss and H. R. Butt: The Relation of the Regenerated Liver Nodule to the Vascular Bed in Cirrhosis. *Gastroenterology*, 15: 285, 1950.
- ³ Palmer, E. D.: *The Esophagus and Its Diseases*. New York, Paul B. Hoeber. Pp. 553. 1952.