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Warren's Operation

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Foreword by A. Dagradi

With 46 Figures

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To Alicy and Silvana

Foreword

I have particular pleasure in introducing this publication by Gian Pietro Marzoli and Sergio Vesentini. Years ago they enthusiastically accepted my suggestion that they should take specific interest in the clinical and surgical problem of portal hypertension, and assess the proposals of surgical experience with regard to this debated physiopathological picture. These thanks are all the more real because in this way the school's attention remained fixed on a subject that had already attracted it profoundly from the start – with Giovanni Castiglioni and Vittorio Pettinari as heads of the school – and then threatened to die away into general conformism. In Italy "precariousness" is easily extended to the concept of school continuity.

In Warren's proposal (1967) of "distal splenorenal anastomosis with disconnection of the spleno-oesophageal from the mesenteric district", I felt there was an intelligent attempt to solve all the basic problems, albeit in different ways. An attempt, that is to say, at alleviating the gastro-oesophageal circulation, thus avoiding haemorrhage, and at ensuring that the liver would maintain the circulatory efficiency with which it was still endowed. The spleen was retained, but there was reason to think that, by reducing blood stasis within its ambit, it would be possible to manage or alleviate any hypersplenism: not an absurd hypothesis if the Americans had sometimes noted in their material functional and even anatomical reversion of the splenopathy after a simple portacaval shunt. This vascular operation of Warren's was not the easiest from the technical standpoint, and perhaps not even the most strikingly effective in cleansing the oesophageal circulation; it might even be superfluous in some cases (e. g. if the cirrhotic liver was now excluded from

portal transit), but in no case would it be harmful. In particular, it would evade the danger of encephalopathy.

Reasons could be found, if they were sought hard enough, for doubts about retention of the spleen in those patients in whom the extent of the hypersplenic damage insistently called to mind Banti's hypothesis. But I have already said that some advantage could be expected even in this direction, and it would be interesting to investigate the potential reversibility of these splenopathies as well. In line with these ideas, I asked my collaborators to make a clinical trial on Warren's operation, at first through a cautious approach to selected cases chosen on grounds of favourable physiopathological prospects and surgical technique, with the possibility of extension, according to confidence, and the immediate results.

I feel that they have reasonably, conscientiously, and ably progressed along this line.

That it would be useful to obtain practical assessment of Warren's conceptual approach from surgeons who, not being involved in its formulation, could ensure sufficient mental detachment from the method as to estimate the real extent of its effects, is a logic of clinical experimentation. In the surgeon's uneven path towards the ideal solution of the problem of "haemorrhagenic portal hypertension" probably the subsequent paper did not constitute a milestone, nor does the contribution I am introducing here seek to be such.

I feel that to gallop down a long, winding and treacherous road abounding in more or less attractive byways, in the blind faith of falling, by chance, on the next milestone showing that the road taken was the right one, is a source of blazing disappointments. Especially as it is very doubtful whether the milestone glimpsed from afar, or over which one stumbles accidentally, is really the right one. This milestone indeed may not yet have been placed and will only be placed with the combined effort of everybody.

Adamo Dagradi

Preface

The purpose of this paper is not to hazard a judgment, which would certainly be premature, but to give an up-to-date balance sheet of the operation proposed by Warren, Zeppa, and Fomon in 1967. Warren's lucid and fascinating approach when putting forward the proposal for an operation (it is in fact an operation including a splenorenal shunt), aimed at avoiding the clinical consequences of a sudden and severe hepatic haemodynamic repercussion and directed to obtaining optimal prophylaxis against haemorrhagic relapse through selective drainage of the oesophago-gastro-splenic venous area alone, induced us to perform this operation in a group of portal hypertensive cirrhotic patients bleeding from varices.

Since Warren's approach to the operation is based mainly on haemodynamic considerations, we felt justified in not contenting ourselves with a mere recording of the clinical results. We have sought to make a haemodynamic check, mainly based on pre- and postoperative abdominal angiography (in some cases with long-term repetition), in order to record the behaviour of the portal circulation and the selectivity of the operation.

These pages are strictly linked to the subject "Warren's Operation"; deliberately, no account is taken of all the many problems of surgical treatment of portal hypertension in a wide sense. Space is given not only to the functional results, but also to the items of literature that specifically deal with the title subject.

We wish to express our gratitude to Prof. A. Dagradi, who set us on our way in this surgery.

Our thanks also go to Dr. Heinz Götze for taking up our proposal and assisting us in the publication of our paper.

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We thank Dr. Gianfranco Briani and radiological technicians Marino Marini, Adriano Tommelleri and Claudio Merigo for their co-operation.

Verona, November 1981 G. P. Marzoli S. Vesentini

Contents

1. Introduction

Although the number of operations performed throughout the world for portal hypertension is put at over 100000 [4] – and this is probably an underestimate – and although an enormous volume of work and experience has been accumulated on the subject, the problem of the ideal treatment of bleeding oesophageal varices due to portal hypertension still seems far from universally accepted solutions. This is demonstrated by the new operations continually proposed and the old operations proposed again with modifications [16, 41, 47, 48, 61].

In the western world, portal hypertension is mainly secondary to intrahepatic block induced by cirrhosis, generally of alcoholic and posthepatitic origin. It is with reference to this type of pathology that surgical treatment takes on highly complicated aspects centred on the trend of cirrhotic liver disease towards spontaneous evolution. This spontaneous trend is moreover not easy to quantify in relation to two other fundamental variables: the course of portal-systemic encephalopathy and the effect that all the operations have on hepatic portal perfusion.

The three variables and their interrelationships fully explain the difficulty of finding a solution of the clinical and therapeutic problems linked to portal hypertension.

All the operations adopted in the past and/or now in use – in addition to having a solely symptomatic significance – lack one or more of the following requisites, which may be considered ideal:

- No operative mortality
- Long-term survival unaffected
- Absolute prophylactic effectiveness
- Absence of repercussions on the basic liver disease
- No change in the haemodynamic status quo
- Absence of tendency to encephalopathic evolution

While it may have reached acceptable results as far as prophylactic effectiveness against haemorrhagic relapse, traditional portal hypertension surgery – based mainly on nonselective truncal and radicular shunt operations – leaves a good deal to be desired on other points, especially the considerable re-

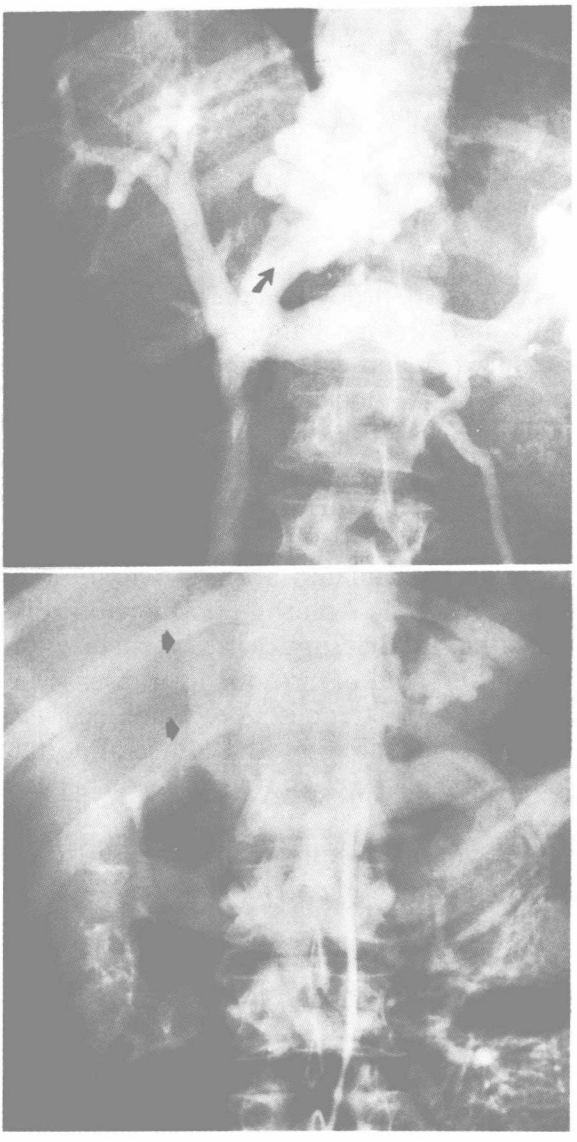

Fig. 1 A, B. Central splenorenal shunt with splenectomy.
A Pre-operative splenoportography. Splenic vein very dilated; retrograde filling of left gastric vein *(arrow)*, which feeds large oesophago-gastric varices, and of superior mesenteric vein *(arrows)*. Hepatopetal portal vein flow.
B Postoperative superior mesenteric angiography: venous fase. Patent anastomosis: distal tract of splenic vein, left renal vein and inferior vena cava *(arrows)* are clearly opacified. Oesophago-gastric varices are still evident, but noticeably reduced in size. The portal vein is not opacified in relation to the hepatofugal direction of blood flow

duction in portal hepatic perfusion with onset and/or aggravation of portal-systemic encephalopathy and the postulated negative effect on evolution of the cirrhotic liver disease [89].

Warren's operation [89] owes its proposal to observations (made during the 1960s) with regard to the development of ascites after terminolateral portacaval shunt and to investigations on the behaviour of portal hepatic perfusion after traditional shunt operations [95]. The large and immediate reduction found in portal hepatic perfusion after a considerable percentage of non-selective operations (Fig. 1) appeared to be responsible for hepatocellular hypoxic distress (the part played by compensatory hypertrophy of the hepatic artery is difficult to assess [10, 94]) –, as well as aggravation of the portal-systemic encephalopathy and depletion of the principles of enteric origin that are presumed to govern hepatic trophism and regeneration [72, 80].

These observations also led to the interpretation of a phenomenon widely observed in clinical practice: the great variability of individual response to portal-systemic shunts in terms of onset and aggravation of hepatic insufficiency. With onset of hepatic insufficiency and encephalopathy, the sudden and considerable shunt of the portal flow is tolerated less the more abundant the preoperative hepatic portal perfusion. The proposal was therefore put forward

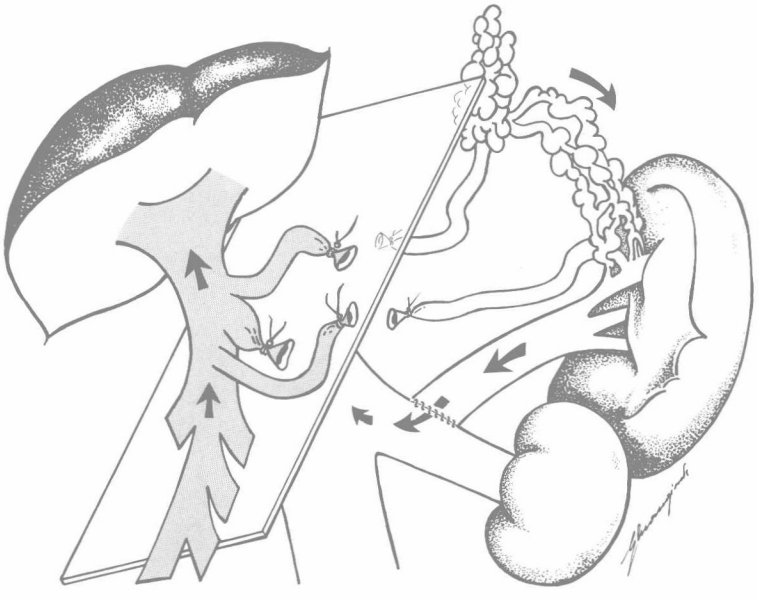

Fig. 2. Diagram of Warren's operation. The lighter part represents the low pressure zone drained by the shunt. The darker part represents the zone with unchanged portal pressure in maintenance of hepatic perfusion

that a pre-operative haemodynamic assessment should be made in order to identify patients at high haemodynamic risk who – since they possess good portal perfusion – are exposed to greater morbidity. However, the effectiveness of conventional angiographic observations in assessing the portal flow volume is sometimes disputed [9, 19, 22, 23, 54, 59, 72, 75, 76, 78].

An operation was devised on the basis of these physiopathological considerations, consisting mainly in a terminolateral splenorenal shunt and a gastro-oesophageal disconnection, with the following aims:

1. Selective drainage of the oesophagogastric varices through a distal splenorenal anastomosis
2. Preservation of portal perfusion by disconnection (Fig. 2) of the mesentericoportal bed from the hepatofugal flows to the varices (section of the right gastro-epiploic vein and right and left gastric veins), and
3. Separation of the enteric circulation into two parts: an oesophago-gastro splenic low pressure tract, drained into the systemic venous circulation through the splenorenal anastomosis, and a mesentericoportahepatic tract deprived of the splenic afflux, but also of the hepatofugal ducts to the varices.

2. Preliminary Investigations

Overall assessment of portal hypertensive patients who have certainly bled from oesophageal varices at least once, and hence are candidates for surgery, involves a series of investigations directed both to ascertaining the presence of a surgical indication (or the absence of contraindications) and selection of the method of operation.

Taking for granted the endoscopic diagnosis of bleeding from oesophageal varices, which is fundamental for avoidance of prophylactic operations, the subsequent steps are directed to:

1. Histological definition of the hepatic disease
2. Clinical and biochemical assessment of the hepatic functional reserve
3. Ascertainment of the existence and degree of encephalopathy
4. Morphological and functional (haemodynamic) study of the enteroportahepatic circulation [88].

Histological Definition

Diagnosis of liver disease is essentially histological, on the basis of percutaneous or laparoscopic biopsy. The histological result is important both in clarifying the aetiology of the cirrhosis and in identifying morphofunctional data that can assist in the formulation of any contra-indications to the operation. These include, for example, the case of chronic hepatitis with considerable signs of activity, the existence of acute hyaline necrosis and the presence of Mallory-Weiss bodies, all conditions capable of endangering the operation.

Clinical and Biochemical Assessment

The overall clinical assessment is based on objective data and biochemical data concerning general conditions, presence of ascites, presence of any other associated pathology, and hepatocellular efficiency as shown by the common hepatic function indices. (In particular, the maximal rate of urea synthesis

(MRUS) is to be recommended, although technically complex to determine [26].) The data thus collected can be used for a first evaluation of the operating risk (and hence of any contra-indications) according to Child's classification. It should, however, be remembered that patients do not always fit exactly into one of the three classes, due to discrepancies in respect of one or more indices [32].

Ascertainment of Encephalopathy

An important factor in pre-operative assessment of patients consists in ascertainment of current portal-systemic encephalopathy [15, 55]. Recognition and evaluation of the encephalopathy are important from a number of standpoints, not least that of supplying a reference point in respect of the postoperative evolution of the encephalopathy. The diagnostic aspects of encephalopathy are complex, and it can probably be asserted that, provided sufficiently sophisticated procedures are used for its assessment, no cirrhotic is completely immune from it. However, a reasonable compromise between precision and practicality can be reached by adopting a routine diagnostic schedule including at least one EEG, ammonaemia, neuromuscular objective examination, and one of the numerous available psychometric tests [15].

Functional Study of the Enteroportahepatic Circulation

Warren's operation imperatively demands a haemodynamic assessment as a fundamental factor in selection of the method of operation.

In current clinical practice such haemodynamic evaluation makes use of the following techniques:

1. Abdominal angiography with a study of the arterial and venous phases
2. Suprahepatic phlebography-manometry
3. Left renal phlebography

These examinations as a whole are defined as the "liver package" [59].

a) Abdominal angiography, performed by transfemoral route, involves injection of the contrast medium into the coeliac trunk, and selectively into the hepatic artery and splenic artery; study of the arterial and venous phases; selective injection of the superior mesenteric artery; and a further study of the arterial and venous phases, possibly aided in the last case by the administration of

drugs [22]. The usable angiographic information has both morphological and functional significance.

The following parameters are assessed and recorded:

Calibre and course of the hepatic and splenic arteries
Volume of liver and intraparenchymal distribution of the arterial vessels
Volume of spleen
Endoluminal morphology of the splenoportal axis
Calibre and direction of the portal vein
Splenoportal axis ratios
Portal flow volume and direction
Existence of hepatofugal pathways
Presence of ascites
Associated hepatic pathology (tumours)

b) Hepatic phlebography is still a useful means of investigation, especially in regard to the aspects of manometric measurement of the occluding pressure (WHVP), which faithfully reflects the pressure conditions existing in the portal system [40, 72]. Hepatic injection of contrast medium is sometimes considered useful for visualization of the portal branches and hence an indication of the hepatofugal volume of portal perfusion [37, 59].

c) Left renal phlebography is an investigation to be carried out at the same time as suprahepatic phlebomanometry. With selective catheterization, not only the morphology and ratios of the left renal vein but also any pathological flow and pressure conditions can be recognised [59, 79].

Extremely valuable haemodynamic and morphological information can also be supplied by investigations such as splenoportography [1] with splenic manometry, and portography with manometry by umbilical route or transhepatic percutaneous route [72, 75, 78, 93]. The pressure readings obtained in this way may be considered to replace those given by suprahepatic phlebography, while the morphological aspects and those pertaining to demonstration of hepatofugal circulations are to be considered as a supplement to the data supplied by abdominal angiography.

Other haemodynamic informations are obtainable through scintiscanning techniques or dye-dilution tests [72]. These investigations can again be considered as a supplement to angiography. The fact that they are bloodless and non-invasive favours their use in assessment of postoperative hepatic portal perfusion [3], although the considerable criticisms on their validity should not be forgotten.