

## IMPORTANCE OF LEFT RENAL VEIN CATHETERIZATION AND PHLEBOGRAPHY\*

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The new methods of renal vein catheterization and retrograde phlebography have provided the means for a direct, thorough morphological investigation of these vessels. A wealth of new haemodynamic and haemochemical information on venous reflux has been available. It is a valuable tool for diagnosing conditions typical of renal veins.

This paper is meant to emphasize certain of our findings which essentially concern the left renal vein which appear to be of the greatest practical importance. The method used allowed us to consistently obtain all the morphological, haemodynamic and haemochemical data we intended to ascertain, while proving to be both more convenient and reliable than other methods such as cavography under block (Gillot),<sup>1</sup> direct percutaneous renal phlebography (Gilsanz *et al.*)<sup>2</sup> (Fig. 1) or left renal phlebography through

standpoint in over 200 left renal vein catheterizations and phlebograms performed by our method on healthy subjects as well as on patients suffering from left renal or suprarenal conditions, or from portal hypertension.

### RESULTS

#### *Morphological Findings*

Left renal phlebograms provide some valuable morphological information about the vein's arrangement, together with a visualization of its collateral vessels. For embryological reasons, as a matter of fact, the left renal vein consists of a trunk of its own and a common trunk into which lead the suprarenal vein, the genital vein and the venous-azygous-lumbar trunk. Such portion of the left renal vein as extends from the suprarenal vein outlet and the caval opening has been recently defined as a *trunc chirurgica* by Gillot<sup>1</sup>—a definition in which we concur in view of the fact that this is indeed the portion used in certain surgical interventions of a portosystemic derivation such as splenorenal and termino-terminal anastomoses (Herlick *et al.*,<sup>3</sup> Hivet *et al.*,<sup>4</sup> Trivellini *et al.*, Galmarini *et al.*), and the vein portion which is closer to the kidney may provide, with its confluent vessels, an adequate outlet channel whenever the 'surgical' section of the renal vein is interrupted.

From a morphological standpoint, the following appear to be the most interesting findings:

(a) The agreement between anatomical data and phlebographic findings (Fig. 2).

(b) The fact that a single left renal vein was to be found in all our patients with one exception where an anomalous venous reflux circuit was provided by the existence of two renal veins with pre- and retro-aortal locations respectively.

(c) The constant arrangement and calibre of confluent collateral veins, which were found to extend in a medio-lateral direction in the following order: the suprarenal vein on top, the reno-azygous-lumbar trunk at the back and the genital vein at the bottom (Fig. 2).

(d) A simultaneous visualization (with the block located next to the cava) of the 3 veins leading into the left renal vein. Particularly significant appears to be the layout of the reno-azygous-lumbar trunk, the value of which should be stressed as a supplementary venous reflux channel in the event of a suprarenal obstruction at the level of the cava inferior, or of the left renal vein being ligated. We regard this trunk to be the abdominal counterpart of the azygous vein in the thorax.

#### *Pathological Findings*

As far as the pathology of the left renal vein is concerned, the method invariably allows such conditions to be detected as an inflammatory thrombotic process or a malignant outgrowth in the lumen by showing an obstructed or restricted filling of the lumen or its extrinsic compression. The resulting diagnostic clue is of considerable value in the forms of proteinuric nephrosis which are now considered secondary to a venous thrombosis, whereas

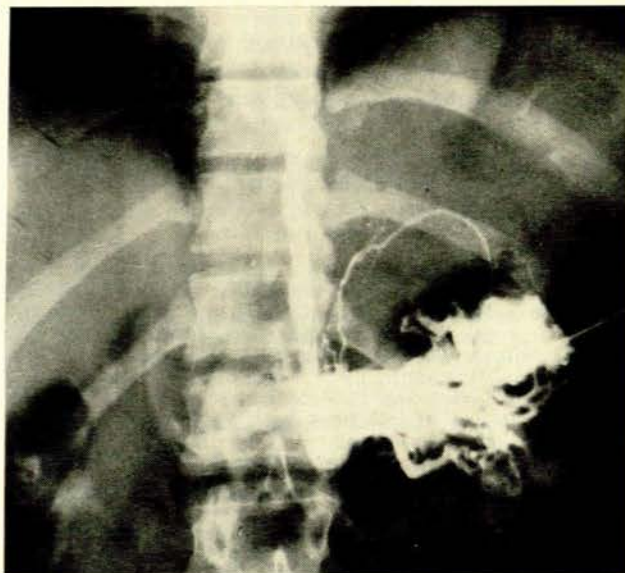


Fig. 1. Direct, percutaneous renal phlebogram providing visualization of renal vein proper as well as of arciform and interlobar veins with simultaneous evidence of capsular veins and of the reno-azygous-lumbar trunk. Note dilution of contrast medium inside common portion of renal vein and cava inferior.

the homologous spermatic vein (Peluffo and Paez).<sup>5</sup> This is a conclusion we have reached after using all these techniques ourselves and finding the first one to be of difficult practical application, the second not entirely safe from the standpoint of renal function, and the third to entail considerable limitations of a morphological order. And it should be added here that none of them permits pressure readings to be obtained, or reflux blood to be sampled. Our paper is a summary of our most significant findings from the morphological and haemodynamic

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in cases of renal tumours associated with a neoplastic invasion of the vein, and a possible extension of the process to the cava, adequate surgical action may be taken to prevent the risk of any malignant emboli breaking loose while the operation is in progress. Obviously, the same diagnostic opportunities also exist for the right renal vein, should it be involved in a similar pathological process. Of particular value are left renal catheterization and phlebography in the study of the homolateral supra-renal vein, as they allow the left supra-renal vein to be visualized together with its branches leading to the gland, and certain diseased conditions of the latter may be inferred from such changes as they would induce in the structure of these vascular branches, whose obstruction, distension or irregularly patterned varicosity (Fig. 3) would provide a clue to a cancerous or hypertrophied gland which could then be checked by appropriate assays of the patient's corticosteroid excretion.

#### Left Renal Vein and Portal Hypertension

Left renal catheterization and phlebography furthermore



Fig. 3. Left renal phlebogram in a case of hyperfunctioning tumour of the supra-renal gland. Note deviation of renal vein (represented by winding vessels surrounding the supra-renal mass), and also horizontal course of distribution branches to kidney.

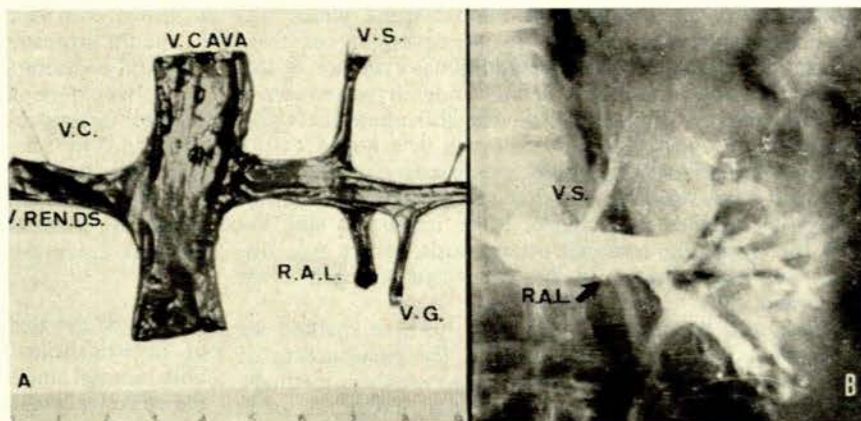


Fig. 2. A: Anatomical dissection of a caval portion with confluent renal veins. Note (left) surgical portion delimited cranially by supra-renal vein (VS) and inferiorly by the reno-azygous-lumbar trunk (RAL) and the genital vein (VG). B: Left renal phlebography. Confluent branches ahead of surgical portion of left renal vein blocked by balloon are clearly evidenced.

provide new and valuable ways to tackle the physiopathological and surgical problems associated with portal hypertension. Left renal vein pressure-readings, in particular, have enabled us to conclude that hypertension was present in 20% of our portal hypertension cases, in some of which this haemodynamic finding was substantiated when a pre-established portosystemic or portorenal anastomosis showed up in the angiogram (Fig. 4), while the distended

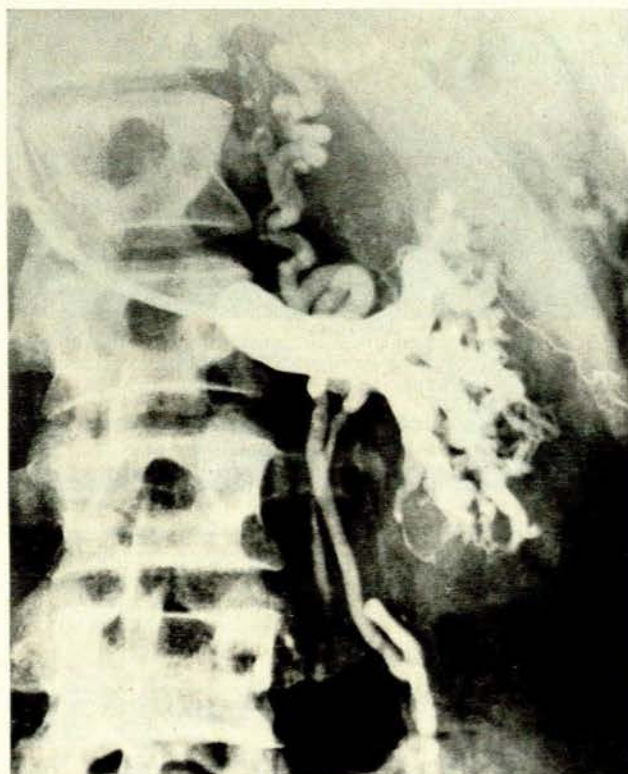


Fig. 4. Left renal phlebogram in a case of portal hypertension induced by cirrhosis of the liver. Note retrogradal visualization of portorenal collateral circulation patterns represented by splenorenal anastomoses.

appearance of the reno-azygous-lumbar trunk which was a constant phlebographic finding whenever any of these conditions was present provides additional evidence of this trunk's role as an outlet for renal venous hypertension.

Phlebograms of the left renal vein also allow the vein's exact location and size to be accurately determined before surgery, so that the advisability or necessity of providing a radicular derivation such as a splenorenal anastomosis may be established in advance. More important still, the need for a termino-terminal anastomosis, where two different vein segments must be connected to each other end to end, may be ascertained.

Nor should the fact be overlooked that the method we are discussing may be used to check the perviousness of splenorenal anastomoses (a field where other methods, such as Leger's,<sup>8</sup> did not prove very satisfactory) as, once the left renal vein is obstructed, the appropriate pressure level can be attained for the anastomosis to be conveniently visualized (Fig. 5).

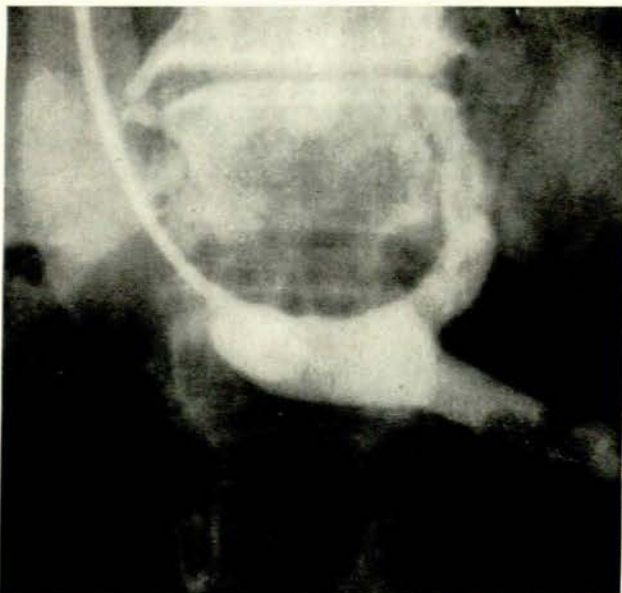


Fig. 5. Left renal phlebogram of a surgical splenorenal anastomosis, affording retrogradal check of perviousness of terminolateral splicing.

The following considerations of a practical order appear to be substantiated by our findings:

Whenever a splenorenal anastomosis of the terminolateral type is considered, left renal vein pressure readings should constantly be checked, as in this particular kind of intervention an appropriate pressure gradient is a definite prerequisite, the lack of which contraindicates this kind of surgical solution in view of the thrombosis hazard

it would then entail.

Should hypertension be found in the left renal vein, instead, a termino-terminal type of splenorenal anastomosis would be indicated as it would ensure the highest possible pressure gradient—provided, however, that in no case and to no extent would the reno-azygous-lumbar trunk be involved on account of the 'relief-outlet' role played by this particular vessel, as observed in cases of portal hypertension where pre-established portorenal anastomoses are present.

#### CONCLUSIONS

In view of the foregoing, the value need not be emphasized of investigations focused on the left renal vein, under both normal and pathological conditions. Our method for the selective catheterization of the left renal vein and for its retrograde phlebography under block would appear to be a prerequisite for obtaining new data of a morphological, haemodynamic and haemochemical order. The semiological information secured under a variety of diseased conditions affecting the kidney and left suprarenal gland as well as in portal hypertension would seem to substantiate the importance of this investigation whenever surgery, and particularly a splenorenal anastomosis, is contemplated.

Of remarkable importance is the demonstration of a twin left renal vein particularly from the standpoint of kidney transplants, as well as the opportunity the surgeon is offered of resorting to adequate operative measures in the event of a phlebogram obtained by our procedure forewarning him that a malignant outgrowth is in progress in the renal vein lumen.

#### SUMMARY

The haemodynamic features and phlebographic patterns of the left renal vein under both normal and pathological conditions are discussed.

From the haemodynamic standpoint, particularly interesting was the finding of increased pressure in that area in some cases of portal hypertension.

From the angiographic standpoint, evidence was obtained of the normal morphological features of the left renal vein and its collateral vessels; the manner in which the left renal vein is affected under certain pathological conditions; the presence of collateral circulation in cases of intrinsic kidney ailments, as well as of porto-systemic portorenal anastomosis in portal hypertension; a visualization of the left suprarenal gland's return circulation and identification of diseased conditions in that district; and the possibility of testing the perviousness of a splenorenal anastomosis.

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