

Splenomegaly and renal displacement

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EDITORIAL COMMENT Splenomegaly is not associated with marked renal displacement. The left kidney may appear to be lower because of the upward displacement of the left hemidiaphragm by the spleen.

A considerable amount of information is available about renal size both in the normal and in pathological conditions. In recent years the radiological assessment of renal size has been particularly stressed (Hodson, 1962), but there is remarkably little evidence on record relating to renal position in pure or applied work. As a result, the radiological assessment of the position of the kidneys tends to be left to an 'impression' of normality or otherwise. This has led to incorrect conclusions and categorical statements that splenomegaly causes downward displacement of the left kidney, which is patently misleading.

POSITION

The right kidney is slightly lower than the left. McClellan (1956) noted that the left kidney was lower than the right in 106 of 1,500 excretion pyelograms (7.1%) and concluded that this was a normal finding in 5.1% of cases. The kidneys correspond in position with the last thoracic and upper three lumbar vertebrae (Meschan, 1959). Textbooks of anatomy and surgical technique are seldom more exact than this in defining the normal limits. It is primarily in the radiological assessment that the position of the kidneys becomes of importance, as once it is appreciated that the left kidney may normally be lower than the right, one will not ascribe this to marked splenomegaly. Serious errors of interpretation in this respect will then be avoided.

REVIEW OF THE LITERATURE

Haslinger (1930) described a case of vertical displacement of the left kidney in Hodgkin's splenomegaly, and Rapant and Bedrna (1933) two similar cases with added medial displacement, and stressed that retroperitoneal masses usually cause a similar displacement. Ecarius (1930) described the first case of renal displacement across the midline due to an

enlarged spleen. Shambaugh (1936) reviewed a series of 24 cases of abdominal masses; of these cases, only one showed renal displacement due to splenomegaly. In conclusion the author stated his opinion that enlargement of the spleen, even when massive, almost never disturbed the position of the left kidney, and Muschat and Edeiken (1940), after a study of renal displacement in various conditions, concluded that hepatomegaly would not cause renal displacement.

Forde, Ostrolenk, and Finby (1960) reviewed 552 cases of splenomegaly seen at the New York Hospital between 1952 and 1957; in 127 cases excretion urography had been performed, and in only 20 of them was renal displacement significant and definitely attributable to the splenomegaly. The report was based on these 20 cases, plus six seen since 1957, and in all downward displacement had occurred in 23, upward in two, and medial in one. Engel (1956) emphasized that displacement of the left kidney generally denotes a retroperitoneal mass but that enlargement of the spleen may displace the left kidney downwards, giving a characteristic 'bent stem' or 'lily-of-the-valley' appearance in the excretion urogram. Despite the ever-increasing use of selective arteriography and isotope scans which give precise anatomical and radiographic localization, few reports have appeared in recent years analysing renal displacement in relation to splenomegaly, although Dowse (1962) stated that it was unusual for an enlarged spleen to cause displacement of the left kidney.

PRESENT SERIES

In the present series, 50 consecutive excretion urograms performed on an unselected group of patients were studied. The examinations were performed by the infusion technique; 250 ml. of 25% solution of Hypaque was infused in six to nine minutes in patients prepared in the routine manner. Relatively

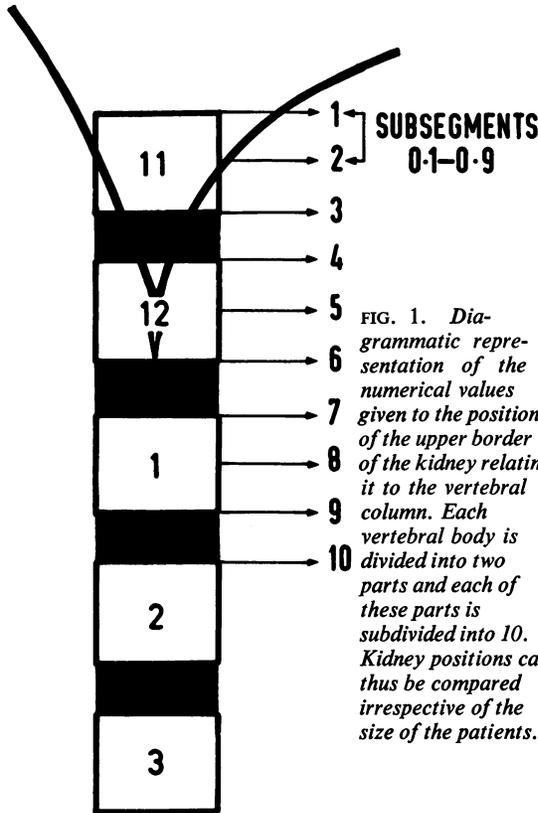


FIG. 1. Diagrammatic representation of the numerical values given to the position of the upper border of the kidney relating it to the vertebral column. Each vertebral body is divided into two parts and each of these parts is subdivided into 10. Kidney positions can thus be compared irrespective of the size of the patients.

dense nephrograms were obtained and renal position could be assessed accurately. A supine film in expiration at 10 minutes after the commencement of the injection was used.

Renal position was assessed by two criteria: the level of the upper pole in relation to the vertebrae and the left hemidiaphragm. In order to facilitate measurement, each vertebra was considered as two segments and each disc space as one (labelled 1-12, Fig. 1), and then each of these segments was subdivided into 10 parts (labelled 0-1-0-9, Fig. 1), these being purely arbitrary positions and not indicating absolute measurements, hence the upper limit of the superior pole could be related to the vertebral column in each case in a manner which also allowed the average position in a given series to be easily computed. Thus the renal position in the vertical plane was established. In the normal series it was found that the upper pole of the left kidney lay at position 3.3 and was 4.54 cm. from the left hemidiaphragm. The upper pole of the right kidney was at position 5.5 (Fig. 2). In subsequent comparisons a difference of 1.5 cm. or more was taken as significant.

A series of 30 cases of splenomegaly in which selective coeliac axis arteriography was performed was examined; in this series, accurate estimation of

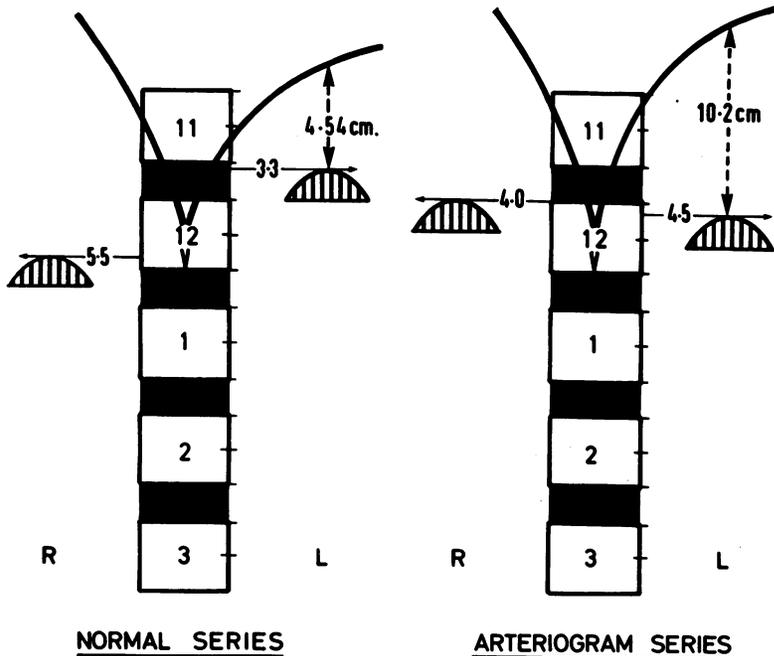


FIG. 2. The positions of the upper poles of the kidneys and the left hemidiaphragms in the normal series are compared with those in the arteriographic series in which there was splenomegaly. It can be seen that the main difference is the increased distance between the left diaphragm and the upper pole of the left kidney in cases with splenomegaly. This increased distance is partly due to a slightly lower position of the left kidney, but even more to the elevated left hemidiaphragm. The right kidney is more cranially placed due to the diminished liver size in the arteriogram series.

splenic and renal size and position could be made; supine films in expiration were used for this study. In this group (Fig. 2) as a whole it was found that the upper pole of the left kidney was at position 4.5 and was 10.2 cm. from the left hemidiaphragm, and the upper pole of the right at position 4 (Fig. 3). The overall displacement was therefore downwards but minimal and accompanied by upward displacement of the left hemidiaphragm of 4.2 cm. The group was then subdivided into three according to spleen size (Fig. 3). The splenic size was graded as moderate (++) , marked (+++), or gross, enlargement (++++). The enlargement was considered moderate if the lower pole extended not more than 3 cm. below the costal margin; between this position and the upper borders of L4 was considered as marked enlargement, and below this level as gross. In these groups the upper pole levels of the left kidney were at positions 3.6, 5.4, and 4.6 respectively. Thus in general there is downward displacement of the left kidney, the difference between the last two groups

being insignificant. Initially the left kidney is displaced slightly downwards, but as the spleen increases in size there is little, if any, further downward displacement.

If the cases are then subdivided according to relative renal position, in 14 cases the renal upper poles were at the same level, position 2.6; in 14 cases the left was below the right at position 5.4, and in two left above right at position 4.6. Thus in 53% of cases there is no significant renal displacement as a result of splenomegaly, and in the remaining 47% there is a small but significant downward displacement. It is to be noted that in 6% of cases the upper pole of the left kidney was above the right, though there was still a downward displacement of the left kidney in relation to the normal series. This accounts for the fact that in these cases the initial impression was of upward displacement, but this was not borne out by the subsequent analysis. The position of the right kidney was higher in the arteriogram series than the normal, and this is due to the fact that in 17

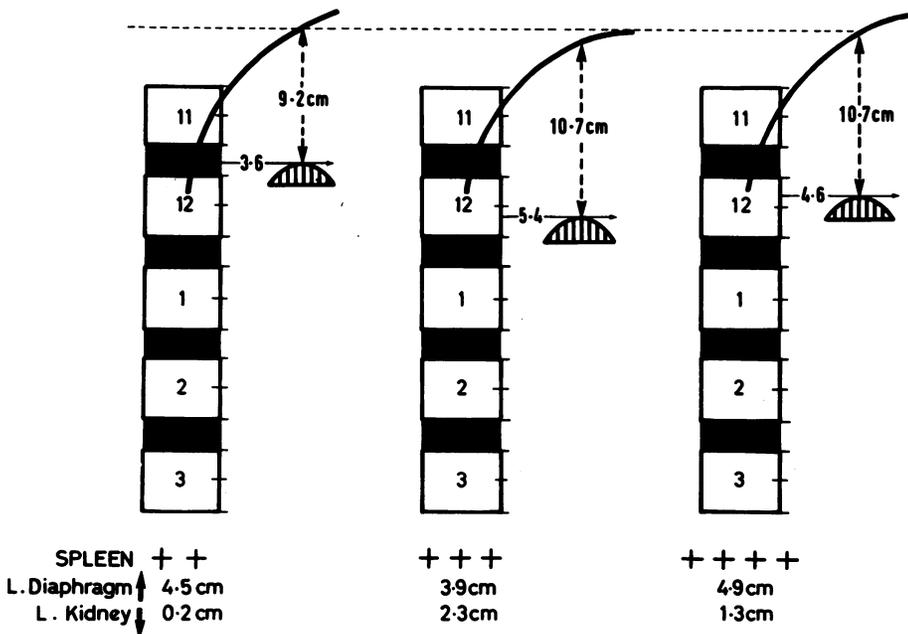


FIG. 3. The arteriographic series was broken down into three groups, those with moderate, marked, and gross, splenic enlargement, and the left hemidiaphragmatic position and kidney positions were compared in each group. It can be seen that the left hemidiaphragm shows a marked initial elevation with little or no further elevation in the groups with more marked splenic enlargement. There is a minimal initial downward displacement of the left kidney, which is more obvious in the group with marked splenic enlargement. However, in the group with gross splenic enlargement there was no further downward displacement, and if anything there was a tendency for the left kidney to be at a somewhat higher position in this group than in the group with marked splenomegaly.

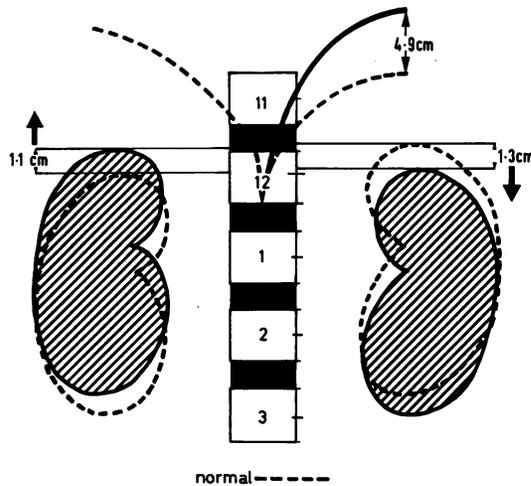


FIG. 4. Composite diagram representing the mean changes in kidney position with portal hypertension due to cirrhosis. The right kidney is higher in position than the left due to the fact that the liver is small, the right kidney moving upwards (1.1 cm.) and the left kidney moving downwards (1.3 cm.) with splenomegaly. The left hemidiaphragm, however, shows the most marked changes (4.9 cm.), being elevated.

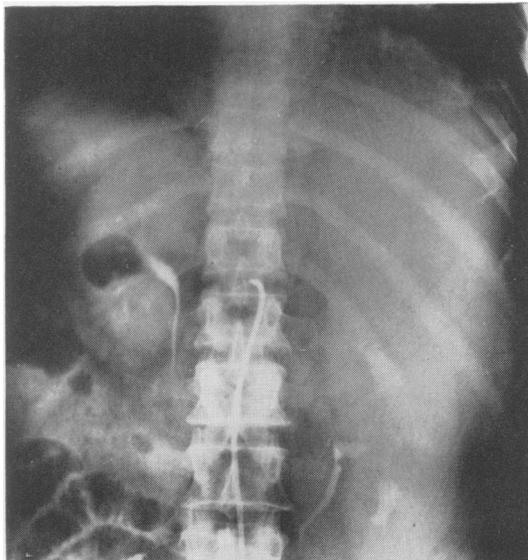


FIG. 5. Immediate post-arteriogram film showing marked but typical changes in the relative kidney positions in cirrhosis with marked splenomegaly. The initial appearance is that of marked downward displacement of the left kidney, but this is not a true appearance. The major changes are the elevation of the left hemidiaphragm which lies above the level of the right, and the upward movement of the right kidney due to the small liver. The left kidney is displaced downwards but only slightly, its upper pole still being at the level of the lower border of D.V.12.

cases the liver was reduced in size demonstrating that diminution in liver size results in upward shift of the right kidney.

CONCLUSIONS

In general, splenomegaly causes little or no displacement of the left kidney even when massive. The impression of marked downward displacement of the left kidney gained on initial inspection of the radiographs is produced principally by upward displacement of the left hemidiaphragm (Fig. 5); this impression is reinforced if there is upward displacement of the right kidney, as commonly occurs in cases of cirrhosis with a small liver. The relative renal position is then reversed. When the renal position is related to the vertebral column, it is found that downward displacement of the left kidney has made only a minor contribution to the markedly increased diaphragm to upper pole distance on the left side, the main factor being upward displacement of the left hemidiaphragm. In the arteriogram series, it was noted that the essential change was an upward shift of the left hemidiaphragm, and as spleen size increased a minor downward shift of the left kidney was added, to give a total upper pole to diaphragm distance with gross splenomegaly of 10.7 cm. (compared with 4.5 cm. in the normal), to which downward displacement of the left kidney had contributed only 1.3 cm. (see Figs. 3 and 4). Clearly, when left renal displacement is marked in relation to the vertebral column, lesions other than splenomegaly are usually responsible and must be excluded before splenomegaly is considered to be the cause.

SUMMARY

The literature relating to splenomegaly and renal displacement has been reviewed: 50 excretion urograms were studied to establish the normal renal position in the vertical plane; 30 coeliac arteriograms with splenomegaly were reviewed and the main finding was upward displacement of the left hemidiaphragm, minor downward displacement of the left kidney in 47% of cases, and upward displacement of the right kidney with a small liver. Splenomegaly is not associated with marked renal displacement.

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REFERENCES

- Dowse, J. L. A. (1962). Left renal displacement due to splenomegaly. *Brit. J. Surg.*, 50, 114-116.

- Ecarius, O. (1930). Beitrag zur Chirurgie der Milztumoren. *Langenbecks Arch. klin. Chir.*, 163, 55-71.
- Engel, W. J. (1956). The significance of renal displacement. *J. Urol. (Baltimore)*, 76, 478-487.
- Forde, W. J., Ostrolenk, D. G., and Finby, N. (1960). Renal displacement associated with enlargement of the spleen. *Amer. J. Roentgenol.*, 84, 889-897.
- Haslinger, K. (1930). Die Indikationen zur transperitonealen Nephrektomie. *Wien. klin. Wschr.*, 43, 970-972.
- Hodson, C. J. (1962). Radiology of the kidney. In *Renal Disease*, edited by D. A. K. Black, pp. 388-417. Blackwell, Oxford.
- McClellan, R. E. (1956). A low lying left kidney. *J. Urol. (Baltimore)*, 75, 198-199.
- Meschan, I. (1959). *An Atlas of Normal Radiographic Anatomy*, 2nd ed., pp. 686-711. Saunders, Philadelphia.
- Muschat, M., and Edeiken, L. (1940). Renal displacement. *Surg. Gynec. Obstet.*, 71, 146-150.
- Rapant, V., and Bedrna, J. (1933). Die Bedeutung der Pyelographie bei Milztumoren. *Chirurg*, 5, 133-137.
- Shambaugh, P. (1936). Displacement of the left kidney in the diagnosis of tumors of the left flank and abdomen. *Radiology*, 26, 335-339.