CASE REPORT

UNILATERAL ENTRAPMENT OF RENAL ARTERY BY DIAPHRAGMATIC CRUS

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ABSTRACT

Renal artery entrapment by the diaphragmatic crus is a very infrequent cause of renovascular hypertension. Renal arteriography confirms a 50% reduction in diameter (stenosis) of the renal artery entrapped by the diaphragmatic crus. During routine dissection for undergraduates in an adult male cadaver the extrinsic compression of renal artery was observed on right side. Crus of the diaphragm were passing anterior to renal artery causing compression of renal artery. On left side it was normal. It is important to detect the aetiology of renal artery stenosis because correct diagnosis of renal artery entrapment is difficult but crucial. The investigations rely on a high index of suspicion and include Doppler ultrasound and spiral computed tomography angiography, which permits the visualization of the diaphragm and its relationships with the aorta. This pathology unlike common renal artery stenosis, requires surgical decompression and sometimes aortorenal bypass graft.

Keywords: Renal artery entrapment, crus of the diaphragm, variations of renal artery.

INTRODUCTION

The renal arteries normally arise off the side of the abdominal aorta.[1] Right renal artery is longer than left renal artery and passes horizontally anterior to the right crus of the diaphragm to reach the hilum.

Stenosis or narrowing of one or both renal arteries due to atherosclerosis or compression of renal artery by diaphragmatic crus, leads to hypertension and renal failure.[2] Most of the variations related to renal artery and diaphragmatic crus remain undiscovered unless surgical procedures like arteriography or venography are undertaken. When identified documentation is essential as it holds many surgical and therapeutic implications.[3]

MATERIALS AND METHODS

During routine dissection of an adult male cadaver provided for UG students, renal artery entrapment by diaphragmatic crus was observed. The area was cleaned properly, dissected and photographed. The artery was traced till the hilum, the length of the artery was measured from its origin till the hilum of the kidney and the external diameter was measured at origin and behind the crus of the diaphragm by using vernier callipers on both the sides and compared.

CASE STUDY

The renal artery was arising from abdominal aorta on both the sides. The right renal artery was passing behind the right diaphragmatic crus towards the hilum of right the kidney.

The length of right renal artery from its origin to the hilum was 4.5cm on right side and 4.0cm on left side. The external diameter at the origin of right renal artery was 0.7cm and behind the crus was 0.67cm which was compared with the left renal artery which was passing anterior to crus of the diaphragm that was 0.7cm.

That shows the marked extrinsic compression of right renal artery at truncal level producing haemodynamically significant stenosis as it passes aberrantly behind the right crus of the diaphragm. There were no accessories renal arteries found on both the sides.

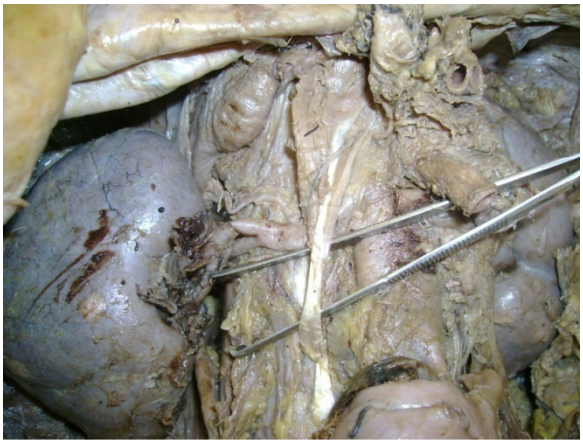

Fig 1: Showing right the diaphragmatic crus passing anterior to right renal artery

The crura of the diaphragm continued till the level of second lumber vertebra, and were finally inserted into the anterior common ligament on the anterior surfaces of the bodies of the second and third lumbar vertebrae and the intervening intervertebral disc (fig 1).

DISCUSSION

Renal artery entrapment by the diaphragmatic crus was first described by D'Abreu who reported two cases proven by surgery in 1962.[4] Less than 20 cases have been reported in the literature. Congenital abnormalities such as abnormal musculo-tendinous fibres, high ectopic renal artery origin or hypertrophic diaphragmatic crus were found to be responsible for these entrapments.[5]

Extrinsic compression of renal arteries will develop when their aortic origin is elevated in relation to diaphragmatic crus/bands.[6] Renal artery stenosis by fibres from crus of the diaphragm is a rare and common correctable cause of hypertension and renal impairment. In general hypertensive population, prevalence of this condition varies between 1 to 5%. The most common causes of RAS are atherosclerosis and fibro muscular dysplasia.[7]

Extrinsic compression of the renal arteries leading to hypertension has been associated with abdominal aortic aneurysm,[8] tumour, hypertrophic, adrenal tissue and psoas muscle band anomaly.[9] However extrinsic compression of one or both renal arteries by the diaphragmatic crura, which is known as renal entrapment syndrome, is rare. Compression by fibres forming part of the crus of the diaphragm impinging on the renal artery by verticalisation of the root of the renal artery. This results in stenosis.[10]

Clinical features suggestive of RAS include abdominal bruit, severe retinopathy, unexplained hypokalaemia and unexplained renal impairment.[7] Early detection of RAS is necessary for effective treatment and to prevent end stage renal disease.

Renal artery compression is not congenital but may be favoured by changes in relationships between the aorta and the musculoskeletal structures over the time. The best way to detect arterial compressions is to analyse systematically the relationships between RAs and the diaphragm when looking for RA stenosis.[10]

Renal artery entrapment may be suspected on angiographic views and proven by cross-sectional imaging.[5] Although Duplex ultrasound is an accurate examination for screening RAS, it does not allow the analysis of the relationship between the renal artery and muscular structures.

Although surgery and stenting have been used for treatment of renal entrapment, they are associated with morbidity and complication. According to Baguet et al use of arterial stent in the situation of muscular compression leads to risk of bending or rupture of the stent compared to balloon angioplasty.[10]

Literature has reported the cases of arterial hypertension in young individuals because of renal artery stenosis due to compression of renal artery by diaphragmatic crus, which was diagnosed by duplex ultrasound, laparoscopy and arteriography. None of the earlier reports have reported about the identification renal artery compression by diaphragmatic crus in cadavers. Hence the importances of present study.

CASE REPORT

CONCLUSION

Compression of a renal artery by the crus of the diaphragm (renal artery entrapment syndrome) should be investigated in proximal renal artery stenosis in young hypertensive patients without other cardiovascular risk factors and where fibro muscular dysplasia is unlikely. Renal artery entrapment seems rather related to an abnormal relationship between the renal artery and the diaphragmatic crus. It should be suspected each time an angiographic reconstruction shows a RA parallel to the aorta in the proximal part of its course. Spiral CTA is a key investigation for identification of the renal entrapment syndrome. A cross sectional imaging has demonstrated renal artery being deformed rather than narrowed due to muscular compression. Once the renal entrapment syndrome is confirmed, surgical management should be a consideration. To conclude, this case report add to the long list of variety of variations of renal artery. Knowledge of possible variations among renal vessels is essential for radiologists and surgeons.

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