

Gerota's fascia over a pelvic ectopic kidney: Myth or reality?

Apul Goel

Department of Urology, CSM Medical University, Lucknow, India

ABSTRACT

Objective: To prospectively evaluate for the presence or absence of Gerota's fascia in a pelvic ectopic kidney, as this is not well documented.

Materials and Methods: Between January 2007 and July 2011, all patients with normal renal functions presenting to the Urology Clinic with pelvic ectopic kidney were evaluated for the presence of fascia similar to Gerota's fascia. Specific evaluation included a contrast-enhanced computed tomography (CT) scan and open surgery where indicated. A literature search using PubMed was also done for the period between 1990 and May 2011 using the terms 'Gerota's fascia', 'perirenal fascia,' and 'pelvic kidney'.

Results: Eleven patients were evaluated. The mean age was 28.6 years (range 7 to 50). The presentation included stone disease in six, pelvi-ureteric obstruction in three, and as part of the evaluation for other causes of lower abdominal pain, it was found in two. A CT scan performed on eight patients did not show any evidence of fascia, while surgical exploration done on seven showed a well-defined fascial layer, at least on the ventral aspect of the kidney. A literature search also did not show any information about Gerota's fascia in the pelvic kidney.

Conclusion: Further anatomical / radiological studies are needed to definitively document the presence of Gerota's fascia around a pelvic kidney. Our data is more in favor of the presence of such a perirenal fascia similar to Gerota's fascia.

Key words: Gerota's fascia, pelvic kidney, perirenal fascia, radical nephrectomy, renal cell carcinoma

INTRODUCTION

Ectopic pelvic kidney is not uncommon and has been estimated to occur in one of 2100 to 3000 autopsies.^[1] Various diseases are known to affect the pelvic kidney, which require surgical treatment.^[2-5] The pelvic kidney has also been used for renal transplantation.^[6,7] The surgical anatomy of the pelvic kidney is thus of great importance. Normally the renal fascia or the Gerota's fascia surrounds the kidney. The presence of Gerota's fascia in the pelvic kidney has not been thoroughly investigated. In recent times, we have

reported that this fascia is absent in a pelvic ectopic kidney, based on our experience of operating a case of renal cell carcinoma.^[8] However, to document the presence or absence of the perirenal fascia around a pelvic kidney, a prospective evaluation of all patients presenting to the Urology Clinic with a pelvic kidney was done.

MATERIALS AND METHODS

Between January 2007 and July 2011, all patients found to have pelvic kidney, with a normal renal function, were included. The reasons for evaluation included ureteropelvic junction obstruction in three, stone disease in six, and as part of the evaluation for lower abdominal pain, in two. One patient had bilaterally placed pelvic-fused kidneys. All patients underwent the recommended evaluation based on the underlying pathological condition; no extra or added investigation was performed. Subsequently, seven patients underwent open surgery (four for stone disease and three for ureteropelvic junction obstruction). All patients were operated using the 'hockey-stick shaped' incision ('J' shaped) in the iliac fossa region. Using the extra-peritoneal approach, careful dissection was done, with the intention of documenting the presence or absence of any perirenal fascia. A detailed literature search was done and books on Anatomy,

For correspondence: Dr. Apul Goel, Department of Urology, B-2/19, Sector-F, Jankipuram, Lucknow - 226020, India.
E-mail: goelapul1@rediffmail.com

Access this article online	
Quick Response Code: 	Website: www.indianjurol.com
	DOI: 10.4103/0970-1591.102712

Embryology, and Urology were consulted. Similarly PubMed was searched between January 1990 and May 2011, using the terms 'pelvic kidney', 'Gerota's fascia,' and 'perirenal fascia.'

RESULTS

Eleven patients with pelvic ectopic kidney were evaluated (12 renal units; one patient had bilateral pelvic kidneys). The mean age was 28.6 years (range 7 to 50) and male to female ratio was 5 : 6. The right to left ratio was 5 : 5. Depending on the need, a CT scan (Philips 64-slice; Version 4) was performed on eight patients. Two patients with lower abdominal pain had normal pelvic kidneys and CT scan was done as part of the evaluation (not for kidneys). Two patients with stone disease were subjected to extracorporeal shock wave lithotripsy (ESWL) and were not explored, but had undergone a CT scan. The remaining seven patients were operated, four of whom had also undergone a CT scan. The CT scan did not reveal any clear-cut fascial layer in any of the patients [Figures 1 and 2]. On surgical exploration (seven cases), the kidney was found surrounded by a well-defined fascial layer in all the cases [Figure 3]. On opening this fascia we could see the kidney and the renal pelvis surrounded by perirenal fat. The whole kidney was not dissected as that was not required. Hence, it was difficult to comment on the limits or extensions of this fascia. Overall, all patients either underwent a CT scan or a surgery, and some had both.

DISCUSSION

Gerota's fascia has great clinical importance as it limits renal pathologies from extending outside. A recent study has

shown that in patients with blunt renal trauma, an intact Gerota's fascia seemed to be associated with less need for angioembolization.^[9] The staging for renal tumors is also based upon Gerota's fascia, to differentiate T3 and T4 tumors, re-emphasizing the importance of this fascia. Moreover, Gerota's fascia has important surgical implications. For example, it has been used in patients with liver injury (for stitching lacerations) and also the Gerota's fascia fenestration surgery has been described for symptomatic relief of floating kidneys.^[10,11] The pelvic kidney may be affected by various diseases, including trauma.^[12] Also, as surgery for pelvic kidney is not uncommon it is important for the surgeon to know the clinical anatomy for surgical planning.

However, the status of the presence or absence of this fascia in pelvic ectopic kidney is not documented. The reason could be that renal tumors in pelvic ectopic kidney are rare with not more than seven cases reported worldwide.^[2] During radical nephrectomy, when dissecting renal tumors, the plane of dissection is outside the Gerota's fascia, and therefore, the identification of this structure is vital. However, unfortunately, even in recent reports, the surgeons have not reported the status of the Gerota's fascia in patients of renal malignancy undergoing surgery.^[2-4,13] Most surgeons perform surgery for benign renal conditions affecting a pelvic ectopic kidney, without noticing this fascia, as it usually has no importance. Even robotic surgery on a pelvic kidney, described recently, does not mention anything about Gerota's fascia.^[5]

In a solitary report on the status of Gerota's fascia, Forbes reported that there was no distinct layer of Gerota's fascia

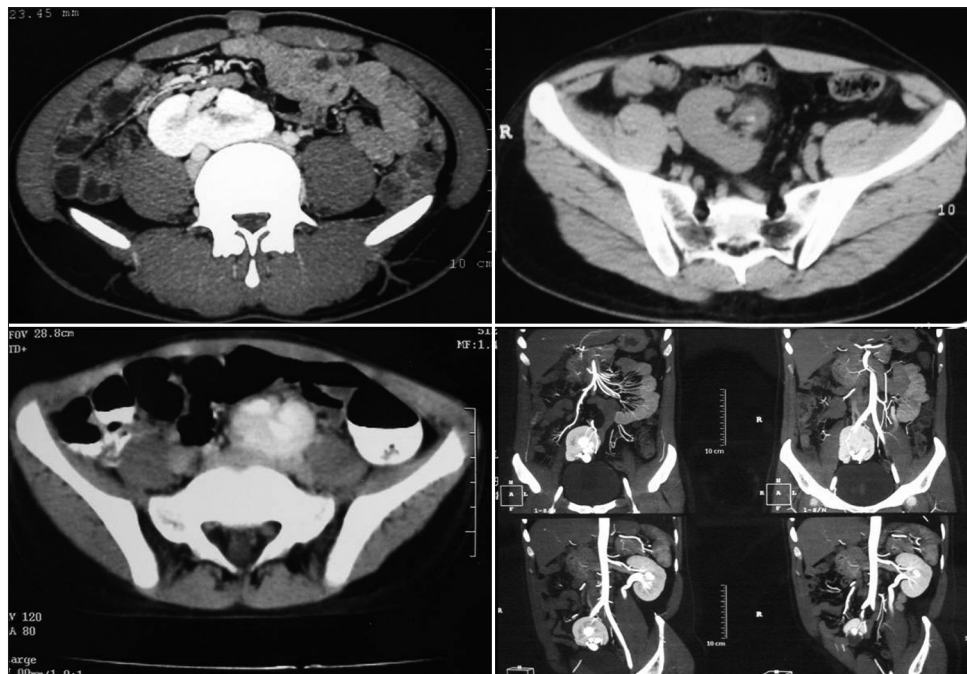


Figure 1: CT scan images of different patients. Gerota's fascia is not visible in any patient

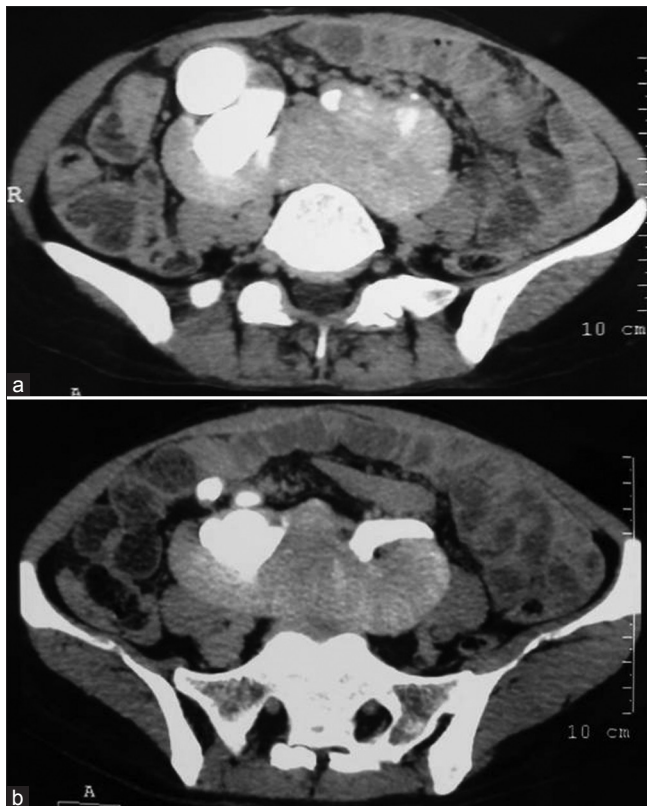


Figure 2: CT scan image of patient with bilaterally placed ectopic pelvic kidneys. No fascia is seen

that surrounded a pelvic kidney.^[14] Other reports on pelvic kidney, however, did not discuss about the presence or absence of this fascia.^[15-21] An extensive search of Medline also did not show any reference of the presence or limits of Gerota's fascia in a pelvic kidney.

Developmentally, Gerota's fascia originates from fascia transversalis, although the exact stimulus for this development has not been described. Gerota's fascia surrounds the normally located kidney and fuses on three sides of the kidney: Superiorly, laterally, and medially. Inferiorly the two layers are separate, enclosing the ureter, the anterior fading into the extraperitoneal tissue of the iliac fossa and the posterior blending with the iliac fascia. Thus, normally it does not extend into the pelvis. The pelvic fasciae are continuous, with retroperitoneal fasciae, and have been categorized somewhat arbitrarily into the outer, intermediate, and inner strata.^[21] The intermediate stratum embeds the pelvic viscera in a fatty, compressible layer, and the pelvic kidney is located in this layer. This fascia also thickens around the pelvic urogenital organs to form their visceral fascia.^[21]

Open surgical exploration in seven of our patients revealed that the kidney was surrounded by perirenal fat, with a fascial covering. However, as all patients had benign renal pathologies, better delineation of this fascia could not be done. Whether to call this layer (on subjective grounds)

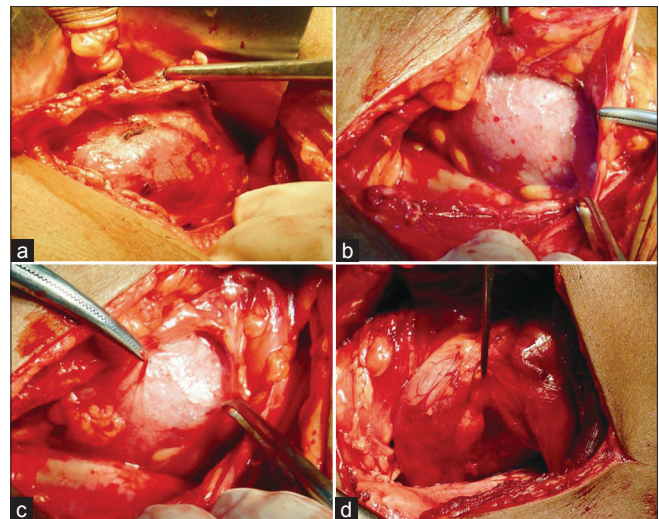


Figure 3: Operative photograph of different patients with left pelvic kidney showing the presence of a distinct perirenal fascia. Unlike fat, which breaks on dissection, this fascial layer is strong and can be dissected off as a layer

the Gerota's fascia is debatable. To objectively document Gerota's fascia we performed a CT scan on eight patients (as Gerota's fascia is visible in normally located kidneys on a multi-detector CT scan), but could not document this layer in any of the patients. The possible explanations could be that the pelvic anatomy is crowded and it could also be due to lesser amount of perinephric fat around the pelvic kidney. Various investigators have described CT scan and magnetic resonance imaging (MRI) findings for a pelvic kidney, but have focused themselves on the vascular anatomy only^[22,23] and there have been no comments on the Gerota's fascia.

There are some pitfalls in this study. First, it is possible that what we are in fact observing is not the perirenal fascia, but something else, as the evidence is only gross. However, microscopy was not performed, as Gerota's fascia is very thin, with no characteristic features, and hence, no additional benefit would have been derived by doing microscopy. Another drawback is the incomplete delineation of Gerota's fascia. However, it is not ethically feasible to do an extra dissection for complete delineation of Gerota's fascia.

On overall analysis, the data is more in favor of a definite perirenal fascia over an ectopic kidney, based on surgical findings. The CT scan findings of the perinephric fat and Gerota's fascia in the pelvic kidney need further evaluation, with higher resolution CT scans. Although the present study may not be definitive, because of the importance of Gerota's fascia, more evaluation is necessary to document its presence or absence. Perhaps some newer radiological test or cadaveric study will give the final answer.

CONCLUSION

Based on the findings, the data is more in favor of the idea that Gerota's fascia is present around a pelvic ectopic kidney.

However, further anatomical and radiological studies may give a final answer about its presence.

REFERENCES

1. Stevens A. Pelvic single kidneys. *J Urol* 1937;37:610.
2. Mahmoudnejad N, Danesh A, Abdi H. Renal cell carcinoma in presacral pelvic kidney. *J Pak Med Assoc* 2009;59:482-3.
3. Grotas AB, Phillips JL. Renal mass in solitary, crossed, ectopic pelvic kidney. *Urology* 2009;73:1223-4.
4. Chung BI, Liao JC. Laparoscopic radical nephrectomy in a pelvic ectopic kidney: Keys to success. *JSLs* 2010;14:126-9.
5. Nayyar R, Singh P, Gupta NP. Robot-assisted laparoscopic pyeloplasty with stone removal in an ectopic pelvic kidney. *JSLs* 2010;14:130-2.
6. Yushkov Y, Giudice A. Pelvic kidney in organ donation: Case study. *Prog Transplant* 2009;19:362-4.
7. Goldsmith PJ, Marco M, Hussain Z, Newstead C, Lodge JP, Ahmad N. Kidney transplantation using the inferior epigastric vessels for multiple anastomoses from a pelvic kidney. *J Am Coll Surg* 2009;209:e1-3.
8. Goel A, Ahuja M, Chaudhary S, Dalela D, Bhandari M. Absence of Gerota's fascia in pelvic ectopic kidney: Implications in laparoscopic radical nephrectomy. *Urology* 2006;68:1121.e21-2.
9. Fu CY, Wu SC, Chen RJ, Chen YF, Wang YC, Chung PK, *et al.* Evaluation of need for angioembolization in blunt renal trauma: Discontinuity of Gerota's fascia has an increased probability of requiring angioembolization. *Am J Surg* 2010;199:154-9.
10. Catani M, De Milito R, Romagnoli F, Modini C. Gerota's fascia flap: A technique for autogenous packing in major liver injuries. *J Trauma* 2010;69:720-1.
11. Koppelstaetter C, Peschel R, Glodny B, Passler W, Lhotta K. Fenestration of the Gerota's fascia as symptomatic treatment of floating kidneys. *Am J Kidney Dis* 2007;50:1020-2.
12. Becker AB, Baig MB, Becker AM. Conservative management of a grade V injury to an ectopic pelvic kidney following blunt trauma to the lower abdomen: A case report. *J Med Case Reports* 2010;4:224.
13. Hernández Toriz N, Flores Ojeda R, Ixquiac Pineda G. Renal tumor in a pelvic kidney. Case report. *Arch Esp Urol* 2006;59:826-9.
14. Forbes G. Pelvic ectopic kidney. *Br J Surg* 1945-46;33:139-42.
15. Mitchell GA. The renal fascia. *Br J Surg* 1950;37:257-66.
16. Martin CP. A note on the renal fascia. *J Anat* 1942;77:101-3.
17. Anson BJ, Riba LW. The anatomical and surgical features of ectopic kidney. *Surg Gynaecol Obstet* 1939;68:37-44.
18. Thomas GJ, Barton JC. Ectopic pelvic kidney. *JAMA* 1936;106:197-9.
19. Thopson GJ. Ectopic kidney: A review of 97 cases. *Surg Gynaecol Obstet* 1937;64:935-43.
20. Judd ES, Harrington SW. Ectopic or pelvic kidney. *Surg Gynaecol Obstet* 1919;28:446-51.
21. Brooks JD. Anatomy of the lower urinary tract and male genitalia. In: Walsh PC, editor. *Campbell's Urology*. Philadelphia: Saunders; 2002. p. 41-70.
22. Kocak M, Sudakoff GS, Erickson S, Begun F, Datta M. Using MR angiography for surgical planning in pelvic kidney renal cell carcinoma. *AJR Am J Roentgenol* 2001;177:659-60.
23. Terrone C, Destefanis P, Fiori C, Savio D, Fontana D. Renal cell cancer in presacral ectopic kidney: Preoperative diagnostic imaging compared to surgical findings. *Urol Int* 2004;72:174-5.

How to cite this article: Goel A. Gerota's fascia over a pelvic ectopic kidney: Myth or reality?. *Indian J Urol* 2012;28:318-21.

Source of Support: Nil, **Conflict of Interest:** None declared.

Staying in touch with the journal

1) Table of Contents (TOC) email alert

Receive an email alert containing the TOC when a new complete issue of the journal is made available online. To register for TOC alerts go to www.indianjurol.com/signup.asp.

2) RSS feeds

Really Simple Syndication (RSS) helps you to get alerts on new publication right on your desktop without going to the journal's website. You need a software (e.g. RSSReader, Feed Demon, FeedReader, My Yahoo!, NewsGator and NewzCrawler) to get advantage of this tool. RSS feeds can also be read through Firefox or Microsoft Outlook 2007. Once any of these small (and mostly free) software is installed, add www.indianjurol.com/rssfeed.asp as one of the feeds.