DISCUSSION

Dr Jateen Prema (Chicago, Ill). You report a relatively rich experience managing a problem rarely seen in most institutions including our own. I do have a few questions about your management of these patients.

You noted that the radiologic criteria were used to identify these patients initially with nutcracker syndrome, yet there seems to be considerable overlap in both groups of patients. It seems unclear to me how you selected patients for operative intervention given that considerable overlap in both groups of patients. It seems unclear to me how you selected patients for operative intervention given that

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REFERENCES

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there was also some overlap in the presenting symptoms of patients, namely flank pain and hematuria. Can you clarify your algorithm for choosing operative candidates in these groups of patients.

Second, in regards to two patients with renal vein thrombosis noted at the time of surgery, is there any other adjacent imaging that could have helped you identify these patients earlier and maybe have led you down a different treatment algorithm, namely endovascular.

And third and finally, there are reports of endovascular management of this problem with some success as you allude to in your manuscript. You present a successful open experience. Do you see a potential shift in the management of this syndrome with endovascular techniques in the future, as you have demonstrated at your institution with the management of May Thurner syndrome as an analogy?

Dr Reed. All excellent questions. Thank you. To address the overlap between the patients managed conservatively and those managed surgically, I think it is very important to note that treatment decisions cannot be made solely based on radiologic evidence of nutcracker syndrome. All patients in this series had radiologic evidence of nutcracker syndrome, but the severity of symptoms differed in the two groups. The patients we took to surgery had very debilitating symptoms of flank pain and/or hematuria that had been going on for quite some time. When possible, we also pursued other confirmatory studies including cystoscopy to isolate hematuria to the left ureter in those patients with gross hematuria. Patients managed conservatively presented with milder and/or atypical symptoms.

To answer your second question, both patients with left renal vein thrombosis had undergone recent preoperative venography. Only a high grade stenosis was seen, and the catheter had been successfully passed into the left renal vein at the time of the study to measure the renocaval pressure gradient. Nothing suggested the presence of a chronic thrombus. Only in hindsight, when we closely re-examined the CT scans and created further reformatted views, were we able to see a suggestion of thrombus. Based on this experience, we would recommend additional reconstruction with a bypass or gonadal vein transposition rather than left renal vein transposition in those patients with chronic left renal vein thrombosis. Renal vein stenting has not been reported in this situation but could certainly be considered.

Finally, endovascular management for the nutcracker syndrome has been described in studies with small numbers of patients and relatively short follow-up. Certainly concerns remain in these young patients regarding the long-term outcome following stenting including stent migration as well as thrombosis. We believe further long-term follow-up data is needed before recommending endovascular management as the primary treatment. It certainly remains a consideration for the future.

Dr John Blebea (Philadelphia, Pa). When one talks about the nutcracker syndrome, most commonly the reference is to extrinsic duodenal obstruction by the SMA. This has been quantified both in terms of the takeoff angle of the SMA from the aorta and the distance between the SMA and the anterior lumbar spine. Have you performed these measurements as objective quantitation of compression by the SMA at the level of the left renal vein?

Dr Reed. Yes, you are exactly right. Those angles are important. The CT scans were reviewed in all our patients and all had confirmed radiologic evidence of the nutcracker syndrome with a narrow aortomesenteric angle and compression of the left renal vein. However, we did not specifically compare the SMA angle or the distance between the SMA and anterior spine in this series.

Dr Blebea. I would recommend doing that because it appears that you have the CT scans from which you can make those measurements.

Secondly, would you like to hazard an explanation for the cause of the symptoms in these patients? In your series, patients were treated not because of the elevated duplex velocities but because of their associated symptoms and hematuria. However, why is it that in these particular patients extrinsic compression of the proximal portion of the left renal vein causes a problem? Under other circumstances, such as trauma or in order to get proximal control in juxtarenal aneurysms, we can with relative impunity ligate and transect the main renal vein and patients do well with outflow via the gonadal, adrenal and lumbar vein collaterals. Why did these patients, with only partial albeit severe extrinsic compression of the main renal vein, become symptomatic?

Dr Reed. The short answer is that we do not know. This is a very unique group of patients with debilitating symptoms from renal venous hypertension secondary to extrinsic compression of the left renal vein. Similar imaging findings can be seen in completely asymptomatic individuals. However, it is just not clear why these patients develop symptoms and others with extrinsic compression or ligation of the left renal vein do not.

Dr Manju Kalra. Dr Blebea, I think I will try and answer that question. Some of the theories that have been put forward are that these patients are different from regular trauma patients who do not develop symptoms following renal vein ligation. Neither did patients in whom we used to ligate the left renal vein during abdominal aortic aneurysm repair. The difference is probably to do with body habitus, the lack of retroperitoneal fat, and possibly certain amount of ptosis of the kidney in patients with nutcracker syndrome that contributes to the venous congestion as well.

Dr Karl Illig (Rochester, NY). Maybe this is a local pain problem, maybe akin to median arcuate ligament syndrome.

I have never seen one of these in my life until last Thursday, when I had a classic patient with an incredible CT scan, and when presenting him in conference it turned out that one of our partners just saw another. So I have got very concrete clinical interest in this right now. My first question is whether we are really sure that this entity actually exists as a categorical diagnosis? I buy your argument and I am a believer, but not all patients in your series were operated on, not all patients had big pressure gradients, and not all patients had hematuria. Are we really sure we are defining this thing correctly?

Right now I think we are just defining it based on compression of the renal vein by CT imaging plus pain. Has anybody ever looked at CT scans in patients without this diagnosis with attention to the renal vein?

Second, if we are going to stent these, should we use a nice short balloon-expandable stent to powerfully blast this thing open with good radial force or should we use a nice gentle little self-expanding stent to provide more chronic remodelling? In other words, what should I do in a few weeks when I stent this guy?

Dr Reed. Diagnosis is difficult and includes a combination of factors. Imaging evidence of left renal vein compression by CT scan, venogram, and a renocaval pressure gradient are all important. “Classical” descriptions of symptoms are important as well. Pain must be isolated to the left flank. If possible, hematuria should be isolated to the left ureter by cystoscopy. A retrospective review was conducted in children and found a large number of asymptomatic “normal” children with evidence of left renal vein compression on imaging. This is why invasive intervention is not commonly recommended in children even if they have some symptoms because these may resolve as they grow up to their full body size and gain some weight. To my knowledge, the same type of study has not been conducted in adults to determine how often radiologic evidence of nutcracker syndrome is seen in asymptomatic individuals. In adults, if you have radiologic evidence of left renal vein compression, a significant renocaval pressure gradient, and classic, severe symptoms of left-sided pain and hematuria which you can localize to the left ureteric orifice, it is reasonable to intervene.

Dr Ruth Bush (Temple, Tex). What type of stent should you use?

Dr Reed. Multiple different stents have been used in the literature. There has not been a large study to validate the specific type. However, I would recommend a self-expanding stent.