

## Nephrology Second Opinions™ Consultation

*Date:*

*Patient:*

### **Discussion:**

The patient has several factors that have led to progressive chronic kidney disease and ultimately end stage renal disease requiring dialysis. The patient underwent a nephrectomy due to renal cell carcinoma. The kidneys are responsible for filtering waste products from the blood, and when there is only one functioning kidney this must take on the entire workload. This can lead to hyperfiltration and eventual kidney damage. This is especially true when there are other factors that cause kidney disease, such as diabetes and acute kidney injury.

The patient also had severe acute kidney injury in 2011 following a motor vehicle accident. While dialysis was needed temporarily and renal function improved, episodes of acute kidney injury also predispose individuals to developing chronic kidney disease and progressive loss of kidney function. Again, there is a higher risk of this in those with only one kidney.

The patient had biopsy proven focal segmental glomerulosclerosis. Focal segmental glomerulosclerosis (FSGS) is a leading cause of kidney disease worldwide. Adaptive FSGS is associated with excessive nephron workload which can be due to single glomerular hyperfiltration associated with nephrectomy.

The patient also has diabetic nephropathy. Diabetes is the leading cause of end stage kidney disease worldwide, and individuals with diabetes have a nearly 2-fold higher odds of chronic kidney disease than those without diabetes. Individuals with diabetes and a solitary kidney have an even higher risk of advanced kidney disease as diabetes itself can also cause hyperfiltration, even in those with two functioning kidneys. Multiple clinical studies have shown diabetes mellitus is also an independent risk factor for the development of acute kidney injury.

The patient was taken to the operating room for a preemptive kidney transplant in 2018 however this was abandoned when it was found that his iliac arteries were calcified. It was determined that the vessels were inappropriate for anastomosis due to the high risk of anastomotic leak or embolization. A CTA in 2020 also showed severe atherosclerosis of the abdominal aorta, iliac arteries, with the celiac axis, SMA, and IMA being completely opacified.

### **Recommendations:**

An extensive workup, including two renal biopsies, have been performed to determine the cause of the

patient's chronic kidney disease as discussed above. His last biopsy in 2016 showed significant scarring and FSGS. Due to the chronicity of the changes on biopsy and the underlying etiology, these changes are irreversible. Therefore, renal replacement therapy is required.

Renal transplant is the ideal form of renal replacement therapy. However, the patient was already evaluated for transplant and even taken to the OR in 2018 for a preemptive kidney transplant. Unfortunately, it was found that there was severe calcification of the iliac arteries and he was not suitable for transplant. Vascular disease of the iliac arteries jeopardizes patient outcomes due to either reduced inflow to the transplanted kidney or implantation failure due to vessel calcification. Not only does severe calcification increase the risk of short term adverse events in kidney transplantation, studies have shown that vascular calcification also increases mortality risk and risk of graft loss. Risk factors for vascular calcification include conditions such as diabetes, smoking, hypertension and dyslipidemia. In addition, patients suffering from end-stage renal disease are at higher risk to develop vascular disease due to added risk factors like chronic uremia, use of calcium-based phosphate binders and, most importantly, dialysis treatment. Severe vascular calcification in the aorto-iliac arteries has been considered as a relative contra-indication for kidney transplantation.

While kidney transplant is the ideal treatment in individuals with end stage renal disease, this is not possible in many cases. With your severe vascular disease, it appears that this is not an option at this time. Home hemodialysis is an excellent option in this case. Home dialysis modalities (home hemodialysis [HD] and peritoneal dialysis [PD]) are associated with greater patient autonomy and treatment satisfaction. Findings from studies have also suggested that home HD is associated with lower rates of hospitalization, decreased mortality, and fewer adverse non-access events. While studies are limited, randomized controlled trial data suggest that intensive HD improves blood pressure control, regresses left ventricular hypertrophy, and normalizes phosphate levels without dietary restrictions. One downside is that there may be an increase in issues related to the dialysis access site (fistula/graft/catheter). Having a large support system is important in continuing home dialysis, and it sounds like this is the case in your situation. It appears that peritoneal dialysis was also attempted but that your PD catheter was removed for non-functioning so it appears this is not an option, also making home hemodialysis an excellent option at this time.

**Answers to patient's questions:**

There are several factors that have led to progressive chronic kidney disease and ultimately end stage renal disease requiring dialysis. The nephrectomy due to renal cell carcinoma in 2008 left you with one functioning kidney. The kidneys are responsible for filtering waste products from the blood, and when there is only one functioning kidney this must take on the entire workload. This can lead to hyperfiltration and eventual kidney damage. This is especially true when there are other factors that cause kidney disease, such as diabetes and acute kidney injury.

You also had severe acute kidney injury in 2011 following a motor vehicle accident. While dialysis was needed temporarily and renal function improved, episodes of acute kidney injury also predispose individuals

to developing chronic kidney disease and progressive loss of kidney function. Again, there is a higher risk of this in those with only one kidney.

Your kidney biopsy demonstrated focal segmental glomerulosclerosis. Focal segmental glomerulosclerosis (FSGS) is a leading cause of kidney disease worldwide. Adaptive FSGS is associated with excessive nephron workload which can be due to single glomerular hyperfiltration associated with nephrectomy.

You also have evidence of diabetic nephropathy. Diabetes is the leading cause of end stage kidney disease worldwide, and individuals with diabetes have a nearly 2-fold higher odds of chronic kidney disease than those without diabetes. Individuals with diabetes and a solitary kidney have an even higher risk of advanced kidney disease as diabetes itself can also cause hyperfiltration, even in those with two functioning kidneys. Multiple clinical studies have shown diabetes mellitus is also an independent risk factor for the development of acute kidney injury.

Your preemptive kidney transplant in 2018 was abandoned when it was found that your iliac arteries were calcified. It was determined that the vessels were inappropriate for anastomosis due to the high risk of anastomotic leak or embolization. A CTA in 2020 also showed severe atherosclerosis of the abdominal aorta, iliac arteries, with the celiac axis, SMA, and IMA being completely opacified.

Vascular disease of the iliac arteries jeopardizes patient outcomes due to either reduced inflow to the transplanted kidney or implantation failure due to vessel calcification. Not only does severe calcification increase the risk of short term adverse events in kidney transplantation, studies have shown that vascular calcification also increases mortality risk and risk of graft loss. Risk factors for vascular calcification include conditions such as diabetes, smoking, hypertension and dyslipidemia. In addition, patients suffering from end-stage renal disease are at higher risk to develop vascular disease due to added risk factors like chronic uremia, use of calcium-based phosphate binders and, most importantly, dialysis treatment. Severe vascular calcification in the aorto-iliac arteries has been considered as a relative contra-indication for kidney transplantation.

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**References:**

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*Electronically Signed by:*

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