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Impact of screening for metabolic syndrome on the evaluation of obese living kidney donors

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ABSTRACT

Background: We report our experience with metabolic syndrome screening for obese living kidney donor candidates to mitigate the long-term risk of CKD.
Methods: We retrospectively reviewed 814 obese (BMI≥30) and 993 nonobese living kidney donor evaluations over 12 years. Using logistic regression, we explored interactions between social/clinical variables and candidate acceptance before and after policy implementation.
Results: Obese donor candidate acceptance decreased after metabolic syndrome screening began (56.3%, 46.3%, $p < 0.01$), while nonobese candidate acceptance remained similar (59.6%, 59.2%, $p = 0.59$). Adjusting for age, gender, race, BMI, and number of prior evaluations, acceptance of obese candidates decreased significantly more than nonobese ($p = 0.025$). In candidates without metabolic syndrome, there was no significant change in how age, sex, race, or BMI affected a donor candidate's probability of acceptance.
Conclusion: Metabolic syndrome screening is a simple stratification tool for centers with liberal absolute BMI cut-offs to exclude potentially higher-risk obese candidates.
Summary: Our center screens obese living kidney donor candidates for metabolic syndrome to maximize donation opportunities while excluding a potentially higher-risk population of mild and moderately obese donor candidates. Retrospective review of 814 obese (BMI≥30) and 993 nonobese living kidney donor evaluations over 12 years found this policy decreased donor acceptance rate without introducing new age, gender or racial biases.

1. Introduction

Over one third of all American adults are obese,[1] and this trend has been paralleled by an increase in obese living kidney donors.[2] Obesity, as defined by body mass index (BMI) is an independent risk factor for developing end-stage renal disease (ESRD), but that association is weak.[3] Furthermore, BMI is an imprecise measure of obesity, making no distinction between toned muscle and fat. Without accurate risk stratification tools, US transplant centers have developed divergent approaches to obese candidates. While some centers eschew BMI cutoffs entirely, some only exclude donors with BMI above 40, others mandate all candidates must have BMI <30.[4]

For centers, such as our own, that have traditionally had more liberal donor inclusion criteria, data in the late 2000's began to accumulate, which suggested that obesity is a pre-operative predictor of poor long term outcomes for living donors.[5,6] At the same time, competing studies suggested the increased risk for obese donors was attributable more to associated comorbidities, and that healthy obese patients would still be reasonable surgical candidates.[7,8] To attempt to minimize long-term donor risk in the face of this emerging evidence, we sought a better way to risk-stratify obese candidates. In 2009, instead of arbitrarily lowering our BMI cut-off and excluding healthier obese donors, we implemented a policy to refine the evaluation of obese individuals by screening all candidates with BMI >30 for metabolic syndrome, and automatically excluding those found to have it. While US transplant centers have great variation in their medical inclusion criteria for living kidney donors,[9–13] no major transplant center has reported the results of such a screening program.

Metabolic syndrome, characterized by three of: abdominal

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obesity, prediabetes, mild hypertension, hypertriglyceridemia and low HDL cholesterol,[14] is a known, but historically underappreciated, risk factor for developing chronic kidney disease (CKD).[15,16] Since the current consensus is that living kidney donation does increase one's risk of developing ESRD, and that risk increase is proportional to one's preoperative risk,[17,18] our center's supposition is that screening out patients with metabolic syndrome will lessen the incidence of post-donation renal failure. While this study is not designed to evaluate the validity of that assumption, as decades-long follow-up may be needed to prove that point, recent research demonstrates that metabolic syndrome contributes to graft loss for kidney allograft recipients[19,20] and to poor outcomes post-donation.[12,21,22]

While other contraindications, including anatomic complexity, pre-existing renal disease, and psychosocial risks, remained in place, the presence or absence of metabolic syndrome has since become an important stratification tool at our center for evaluating otherwise acceptable obese candidates. Prior to implementing this policy, candidates were not routinely screened for the condition, and so many with the condition were likely allowed to donate.

The purpose of the investigation was primarily to define the scope of metabolic syndrome in living kidney donation. We appraised the prevalence of metabolic syndrome in the donor candidate population, assessed whether our committee had been permitting donation in these candidates before the formal screening process began, and compared these findings with the hypothetical of a strict BMI limit at our center. We then considered whether this screening resulted in any unintended consequences by exacerbating any gender, age or race disparities in acceptance, or caused additional delay in the evaluation. A secondary objective was to determine the potential to simplify the metabolic screening process through reduced data collection.

2. Materials and methods

2.1. Study population

We retrospectively reviewed all living kidney donor evaluations performed from January 1, 2003 to December 31, 2014. After March 13, 2009, our center implemented its metabolic syndrome screening policy for obese (BMI $\geq$ 30) candidates (Table 1) using the NCEP ATP III definition of metabolic syndrome.[23] All new donor candidates were stratified by BMI categories into obese and non-obese. All obese patients had a fasting lipid panel, fasting glucose levels and, if the provider was concerned for hypertension, a 24 h ambulatory blood pressure monitor, to evaluate for metabolic syndrome. All obese patients found to have metabolic syndrome were excluded from kidney donation by the transplant committee, although they were encouraged to improve their metabolic profile and return for re-evaluation.

All evaluations of obese patients (n = 814) were included, and a random sampling of non-obese patients (n = 993 of 1981 total non-obese evaluations) from the same time period was utilized as a comparison group. As an aside, note that the comparison group is necessary in order to rule out any changes in acceptance rate (i.e., pre-versus post-policy implementation) as being artefactual and due to secular trends. For instance, a decrease in acceptance rates among obese patients would not appear to be due to policy implantation if a similar decrease occurred among non-obese patients.

Patients whom the transplant committee decided were allowed to donate were coded as 'accepted,' and patients who proceeded to donate their kidney were coded as 'donors.' Because our institution uses a BMI cutoff to determine which individuals receive metabolic syndrome screening, our report stratifies the cohort by BMI instead of the waist circumference. We excluded patients who were evaluated for listing at another transplant center, and those with incomplete BMI data. Demographic characteristics obtained include date of birth, race and sex. Clinical variables obtained within 6 months of initial evaluation include date of all evaluations, BMI, blood pressure, blood glucose, lipid levels, HDL cholesterol.

2.2. Outcomes

Evaluations were further stratified by the transplant committee decision to accept the donor, whether the committee identified them as having metabolic syndrome, and if they donated. Intraoperative and postoperative complications included blood loss requiring transfusion, conversion from laparoscopy to open procedure, wound complications, hernia, prolonged ileus, urinary tract infection (UTI), urinary retention, renal dysfunction, and other complications requiring readmission, and were obtained through chart review, analysis of financial records, and the electronic medical record search engine (EMERSE).[24] Chart review and EMERSE were also used to identify patients who were asked to lose weight and returned for re-evaluation.

2.3. Statistical analysis

2.3.1. Descriptive analysis

With respect to descriptive statistics, continuous variables were summarized by their means, while percentages were used for categorical variables.

2.3.2. Effect of policy implementation – screening for metabolic syndrome

To quantify the effect of our metabolic screening policy on acceptance rates, we used the difference-in-differences approach. This type of approach is frequently used in health services. A "difference of interest" is computed (in our case, this is the difference in acceptance rates among obese donor candidates: post-policy implementation minus pre-policy implementation). Next, a "reference difference" is computed (for our purposes, this is the post-policy minus pre-policy difference, but among non-obese donor candidates). Since metabolic screening was only conducted on obese candidates, the "reference" difference would be expected

Table 1
Metabolic syndrome.

Metabolic syndrome[a] defined by having at least three of the following criteria:		
	Men	Women
Abdominal obesity	Waist circumference >40″	Waist circumference >35″
Serum Triglycerides	>150 mg/dl (or on treatment)	
Serum HDL Cholesterol	<40 mg/dl (or on treatment)	<50 mg/dl (or on treatment)
Blood Pressure	130/85 (or on treatment)	
Blood Glucose	Fasting glucose > 100 mg/dl (or on treatment), confirmed by 2 h oral glucose tolerance test > 140 mg/dl	

[a] Only obese patients (BMI $\geq$ 30) were screened for metabolic syndrome.

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