Discordant Utility of Ideal Body Weight and Body Mass Index as Predictors of Mortality in Lung Transplant Recipients

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Background: An upper limit of 130% predicted ideal body weight (PIBW) has been promulgated for assessing lung transplant (LTx) candidacy, but no data in the lung transplant population support this value. A prior study used body mass index (BMI) to suggest greater mortality risk in obese allograft recipients, but the number of studied patients was small.

Methods: Pre-operative PIBW percentage and BMI were obtained for all first-time, adult LTx recipients at our institution (n = 283). We compared survival data at 90 days and as of July 31, 2002, using multivariable regression and Cox modeling.

Results: There were 46 obese (BMI ≥ 30) patients and 72 patients >130% PIBW, including 43 patients previously thought to fall within a normal PIBW range who were reclassified as overweight for this analysis. Cox modeling revealed no significant impact of PIBW (>130% or continuous) or BMI (>30 kg/m^2 or continuous) on overall survival. Predicted ideal body weight also had no influence on 90-day mortality. When we tested PIBW in the group previously deemed of acceptable weight, we likewise found no association with mortality at 90 days or overall. For BMI only, 90-day odds ratios for death were significantly greater for obese (BMI ≥ 30; odds ratio, 3.16; 95% confidence interval, 1.05–9.48) patients than for normal-weight patients.

Conclusion: Indices of pre-operative obesity did not predict long-term outcome in this large cohort of LTx recipients. The data suggest that BMI stratification may identify a group of patients at risk for increased short-term mortality, whereas PIBW is not a significant outcome predictor. J Heart Lung Transplant 2005;24:137–44. Copyright © 2005 by the International Society for Heart and Lung Transplantation.

Selection of candidates for lung transplant is inherently a problem of defining criteria and of establishing priorities. Thus, medical comorbidities known to influence patient survival must be considered during the selection process. Obesity has been described variously as a relative or an absolute contra-indication for cardiac[1-3], liver[4], and renal transplantation.[5-9] In the lung transplant literature, one study suggested increased long-term mortality when using body mass index (BMI) to identify obese patients, but the study was limited by a small sample size (10 obese patients).[10] A larger study suggested that 90-day mortality after lung transplantation increases 5-fold when the BMI exceeds 27 kg/m^2, but did not describe longer-term outcomes.[11] Before either of these reports, the International Society for Heart and Lung Transplantation (ISHLT) promoted a cutoff of 130% ideal body weight (IBW) as a standard for patient selection.[12] We performed a retrospective review of our transplant experience in an effort to determine whether pre-transplant weight ≥130% predicted IBW was a risk factor for short- or long-term mortality. Until recently, we used a less stringent weight scale in our center to assess patient candidacy. This afforded an opportunity to study a population of patients who were >130% IBW by contemporary standards but otherwise free from selection bias.

METHODS

Pre-transplant weight was collected by chart review for all patients who underwent lung transplantation at the Cleveland Clinic Foundation from February 14, 1990, to April 25, 2002. The most proximate weight that preceded the date of transplantation was used for analysis; the median interval between weight measurement and transplantation was 79 days. Patients <18 years old at the time of surgery were excluded, as were retransplant recipients. We observed all patients for a minimum of

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90 days after transplantation or until death; follow-up was terminated on July 31, 2002. We based IBW calculations on a formula derived from the Metropolitan Life Insurance Tables: for women, IBW = 100 lbs + 5 lbs for each inch >5 feet of height, and for men, IBW = 106 lbs + 6 lbs for each inch >5 feet of height.[1,2] We defined percent IBW in accordance with the ISHLT criteria:[12] underweight < 70%, acceptable = 70% to 130%, and overweight > 130%. Additionally, a group of patients, labeled the *reclassified group,* was identified that exceeded 130% IBW according to the Metropolitan Life Insurance Tables but were thought to be within acceptable limits when a scale based on average body weight was used at our institution (up to March 2002).

Body mass index is weight divided by the square of height (kg/m^2). Body mass index was stratified according to the most recent World Health Organization definitions:[13] underweight (BMI < 18.5 kg/m^2), normal weight (18.5–24.9 kg/m^2), overweight (25–29.9 kg/m^2), and obese (≥30 kg/m^2). Causes for transplantation were grouped into 4 categories based on the primary underlying pathology: obstructive, restrictive, pulmonary-vascular (including congenital cardiopulmonary disease), and bronchiectatic lung disease. The Cleveland Clinic Foundation institutional review board approved this study.

We assess lung transplant candidacy at our center using the guidelines of the International Society for Heart and Lung Transplantation.[12] All patients are screened for coronary artery disease with non-invasive stress testing. Those with equivocal or positive stress tests proceed to coronary angiography. In addition, all men aged >40 and women aged >50 automatically proceed directly to coronary angiography. In the presence of significant and surgically amenable single-vessel coronary artery stenosis, a few patients have undergone simultaneous coronary artery bypass surgery at the time of transplantation (n = 3); this practice has been in effect since 2001. Otherwise, significant atherosclerotic vascular disease has been an absolute contra-indication to transplantation. After transplantation all patients are observed longitudinally in a specialty clinic with attention to health-maintenance issues, including control of blood pressure, serum cholesterol and glucose concentrations. During the study period, the first-line immunosuppressive regimen included corticosteroids, azathioprine, and cyclosporine until 2001; since then, we have used corticosteroids, azathioprine, and tacrolimus. Induction immunosuppression (anti-thymocyte globulin) has been used only in cases of significant concentrations of pre-formed antibodies (n = 11).

We included 283 patients in the analysis. Median follow-up was 32.2 months (interquartile range, 17.9–58.5 months) for survivors and 9.5 months (interquartile range, 3.1–28.0 months) for non-survivors. Overall survival rates at 30 days, 90 days, 1 year, 5 years, and study conclusion were 92%, 88%, 74%, 42%, and 33%, respectively (Figure 1).

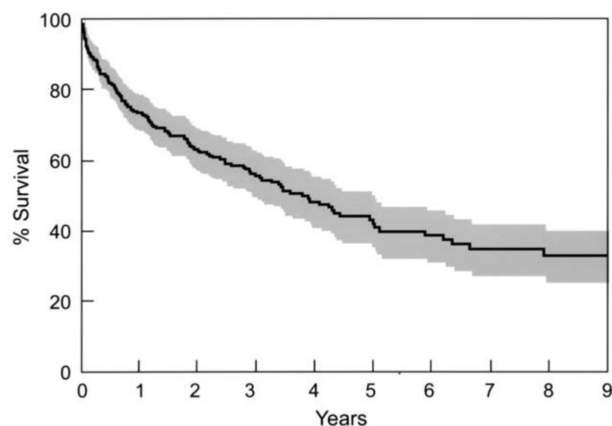

Figure 1. Kaplan-Meier survival curve for all patients. Shaded area represents the 95% confidence interval.

Statistical Analysis

Baseline data included in analysis were age, sex, race (white vs non-white), cytomegalovirus status for donor and recipient, underlying disease category, and type of transplantation (unilateral or bilateral). Univariable statistics were generated by comparing each variable between weight classifications with analysis of variance for continuous variables and chi-square or Fisher's exact tests for categorical variables. We placed variables significant at a level of 0.2 into an initial multivariable model and used backward logistic regression to isolate significant predictors for 90-day mortality. We constructed Kaplan-Meier survival curves for all weight categories and computed log-rank statistics for overall survival and for pre-specified time-points (90 days, 1 year, and 3 years) by treating all patients who survived beyond those time-points as censored observations. Finally, we constructed a Cox proportional hazards model for overall survival. Before modeling, we assessed proportionality assumptions using empirical plots and testing of time-dependent covariates. Weight was entered both as a continuous and as a categoric variable for logistic regression as well as for Cox modeling. We used a significance level of 0.05 for all final analyses.

RESULTS

Our study population had a median age of 50 years (range, 18–66 years). Fifty-two percent were men, and they predominantly were white (263/283, 93%). The population included 177 single lung transplantations and 106 (37% of the total) bilateral lung transplantations, including 4 heart–lung transplantations. Reasons

Table 1. Comparison of Variables by Percent Ideal Body Weight

	<70%	70–130%	>130%	*p* value	Reclassified group	*p* value[b]
Number	8	203	72		43	
Height (cm)[a]	177 (8.6)	169.1 (10.4)	163.9 (9.5)	<0.01	161.5 (8.4)	<0.01
Age[a]	34.8 (12.7)	46.7 (12.7)	47.5 (10.5)	0.02	47.7 (10.7)	0.60
Sex (male)	7 (88%)	119 (59%)	21 (29%)	<0.01	6 (14%)	<0.01
Race (white)	7 (88%)	190 (94%)	66 (92%)	0.71	37 (86%)	0.11
Cause						
Obstructive	4 (50%)	111 (55%)	34 (47%)		21 (49%)	
Restrictive	0	34 (17%)	22 (31%)	<0.01	12 (28%)	
Cardiovascular	0	13 (6%)	15 (21%)		9 (21%)	<0.01
Bronchiectatic	4 (50%)	45 (22%)	1 (1%)		1 (2%)	
Donor CMV (+)	5 (38%)	110 (54%)	45 (63%)	0.42	26 (60%)	0.45
Recip. CMV (+)	3 (38%)	128 (63%)	48 (67%)	0.27	28 (65%)	0.83
Transplant						
Unilateral (R)	2 (25%)	49 (24%)	24 (33%)		15 (35%)	
Unilateral (L)	1 (13%)	77 (38%)	24 (33%)	0.29[c]	15 (35%)	0.50[c]
Bilateral	5 (63%)	74 (37%)	23 (32%)		13 (30%)	
Heart–lung	0	3 (1%)	1 (1%)		0	
LOS (days)	21.6 (10.7)	23.4 (18.5)	20.2 (17.0)	0.44	21.1 (18.3)	0.48

[a]Data expressed as mean (standard deviation).
[b]Refers to the comparison of the reclassified group (see Methods for definition) vs 70%–130% ideal body weight.
[c]Compares 3 categories, collapsing bilateral and heart–lung into 1 category.
Height, age, LOS compared by analysis of variance, sex compared with Fisher's exact test, otherwise chi-square test used for all comparisons.
CMV, cytomegalovirus; LOS, length of stay.

for transplantation were primarily obstructive disease in 149 patients (53%), restrictive disease in 56 (20%), bronchiectatic lung disease in 50 (18%), and pulmonary vascular or congenital cardiac disease in 28 (10%). Using IBW percentage, we found 8 (3%) underweight patients, 203 (72%) acceptable-weight patients, and 72 (25%) overweight patients. Forty-three of the patients in the >130% category (15% of the total cohort), previously considered within acceptable-weight limits, were assigned to the reclassified group. In the BMI classes, 43 (15%) were underweight, 120 (42%) were of normal weight, 74 (26%) were overweight, and 46 (16%) were obese patients.

Tables 1 and 2 show descriptive and univariable statistics by weight categories. In the analysis of IBW, we found significant differences among patient groups in height ($p < 0.01$), age ($p = 0.02$), sex ($p < 0.01$), and underlying disease ($p < 0.01$, Table 1). All other analyzed variables were similar among groups. When analyzed by BMI strata, age ($p < 0.01$), underlying disease ($p < 0.01$), and transplant type ($p = 0.03$) varied significantly among groups (Table 2). The age differences between groups are because of disproportionately high representation in the underweight categories of younger patients with bronchiectatic lung disease (mostly cystic fibrosis). Exclusion of the underweight categories eliminates the age differences between all other weight strata ($p = 0.13$ for BMI and $p = 0.59$ for IBW). The difference in transplant type between BMI categories is attributable to the same cause: underweight patients predominantly tended to receive bilateral transplants for cystic fibrosis.

We performed multivariable logistic regression analysis for 90-day survival, including IBW and BMI as stratified and continuous variables (Table 3). When analyzed according to IBW categories (overall and reclassified) or continuous BMI, we found no difference in mortality at 90 days. Underlying disease was associated with worse 90-day survival in the IBW model ($p = 0.016$). Compared with obstructive disease, we found increased risk for pulmonary vascular disease (odds ratio [OR], 4.02; 95% confidence interval [CI], 1.37–11.78), and a trend toward increased mortality for restrictive disease (OR, 2.33; 95% CI, 0.90–6.07) and bronchiectatic lung disease (OR, 1.36; 95% CI, 0.45–4.18). We also observed a trend toward worse survival in non-whites ($p = 0.077$; OR, 2.81; 95% CI, 0.90–8.79). By BMI strata, overweight (OR, 3.93; 95% CI, 1.49–10.36) and obese patients (OR, 3.16; 95% CI, 1.05–9.48) had increased odds for death at 90 days compared with the normal-weight group. No other variable was a significant predictor of death at 90 days in the BMI groups.

Comparing the two regression analyses suggests that BMI stratification may identify a group of patients at increased risk for early mortality. There may be some unrecognized interaction of the BMI categories with race and underlying disease, because these variables approached significance only in the models using IBW. Furthermore, the number of non-white patients in this

Table 2. Comparison of Variables by Body Mass Index

	Underweight	Normal	Overweight	Obese	*p* value
Number	43	120	74	46	
Height (cm)[a]	168.5 (9.6)	168.0 (11.2)	168.2 (10.0)	167.1 (10.2)	0.93
Age[a]	38.3 (14.3)	46.6 (12.6)	50.0 (9.2)	48.6 (10.9)	<0.01
Gender (male)	25 (58%)	60 (50%)	40 (54%)	22 (48%)	0.73
Race (white)	39 (91%)	115 (96%)	65 (88%)	44 (96%)	0.15
Cause					
Obstructive	18 (42%)	66 (55%)	45 (61%)	20 (43%)	
Restrictive	3 (7%)	17 (14%)	19 (26%)	17 (37%)	<0.01
Cardiovascular	1 (2%)	10 (8%)	8 (11%)	9 (20%)	
Bronchiectatic	21 (49%)	27 (23%)	2 (3%)	0	
Donor CMV (+)	22 (51%)	67 (56%)	43 (58%)	28 (61%)	0.81
Recip. CMV (+)	26 (61%)	67 (56%)	51 (69%)	35 (76%)	0.07
Transplant					
Unilateral (R)	8 (19%)	30 (25%)	23 (31%)	14 (30%)	
Unilateral (L)	9 (21%)	45 (38%)	31 (42%)	17 (37%)	0.03[b]
Bilateral	25 (58%)	44 (37%)	19 (26%)	14 (30%)	
Heart–lung	1 (2%)	1 (1%)	1 (1%)	1 (2%)	
LOS (days)	24.9 (16.6)	22.9 (19.5)	21.8 (16.0)	20.1 (18.0)	0.64

See Methods section for definition of body mass index strata.
[a]Data expressed as mean (standard deviation).
[b]Compares 3 categories, collapsing bilateral and heart–lung into 1 category.
Height, age, LOS compared by analysis of variance, sex compared with Fisher's exact test, otherwise chi-square test used for all comparisons.
CMV, cytomegalovirus serologic status; LOS, length of stay.

cohort was small (n = 20), increasing the possibility of an alpha-type error. The associations of underlying disease and race with mortality are in accordance with prior evidence,[14] although the magnitude is greater in the current study.

We generated Kaplan-Meier survival estimates for all categories of obesity indices for the purpose of examining survival estimates at later time-points (Figures 2–4). Using log-rank analysis, we found no significant 90-day survival differences when we categorized patients by IBW, for comparisons between all IBW categories (p = 0.27) and for comparison between patients at 70% to 130% IBW vs the reclassified group (p = 0.49). Body mass index categorization revealed increased 90-day mortality for overweight and obese patients. Survival for these 2 groups was 81% (95% CI, 72%–90%) and 83% (95% CI, 72%–94%), respectively, vs 94% (95% CI, 90%–98%) for normal weight (p = 0.02). The effect of BMI categories on survival was abolished by 1 year and remained so for all subsequent time-points. For example, at 1 year, estimates for survival by BMI strata were (p = 0.28): 77% normal (95% CI, 70–85%), 67% overweight (95% CI, 57–78%), and 71% obese (95% CI, 58%–85%).

Table 3. Multivariable Logistic Regression for 90-Day Mortality

Effect	*p* value	Odds ratio estimate (95% confidence interval)
Model with strata of body mass index		
BMI category	0.036	
Obese vs normal		3.16 (1.05–9.48)
Overweight vs normal		3.93 (1.49–10.36)
Underweight vs normal*		1.72 (0.47–6.27)
Model with percent ideal body weight (categories or continuous)		
Race (non-white)	0.077	2.81 (0.90–8.79)
Cause (vs obstructive)	0.016	
Restrictive*		2.33 (0.90–6.07)
Vascular/cardiac		4.02 (1.37–11.78)
Bronchiectatic*		1.36 (0.45–4.18)

*Not significant.
BMI, body mass index.

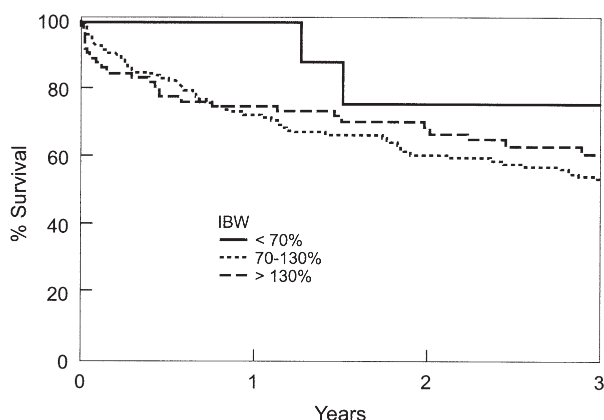

Figure 2. Kaplan-Meier survival curve for percent ideal body weight (IBW) strata.

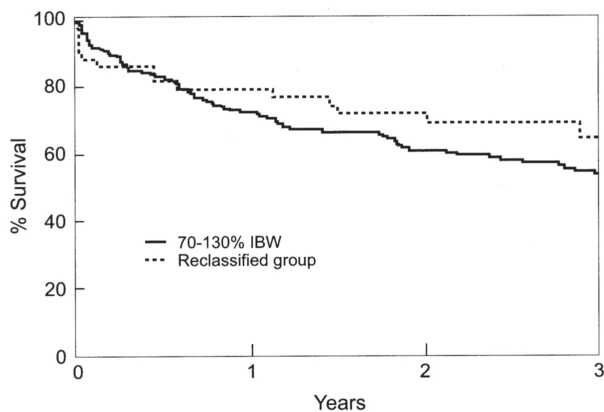

Figure 3. Kaplan-Meier survival curve for reclassified weight group vs 70% to 130% ideal body weight (IBW).

We constructed a Cox proportional hazards model for overall survival. Weight indices were not significant when entered as BMI strata, IBW strata, or as continuous variables (Table 4). Similar to the logistic regression estimates for early mortality, non-white race (hazard ratio, 1.8; 95% CI, 1.0–3.4) and underlying disease were significant covariates, with better survival for patients with obstructive disease. Male sex (hazard ratio, 1.5; 95% CI, 1.1–2.2) and unilateral lung transplant (hazard ratio, 2.5; 95% CI, 1.4–4.5) also were associated with accelerated mortality. These associations also have been noted in the United Network for Organ Sharing database.[14]

Table 4. Cox Proportional Hazards Model for Overall Mortality

Effect	p value	Hazard ratio estimate (95% confidence interval)
Men	0.03	1.52 (1.05–2.18)
Unilateral vs bilateral	<0.01	2.5 (1.39–4.55)
Race (non-white)	0.045	1.84 (1.01–3.35)
Cause (vs obstructive)	0.03	
Restrictive		1.71 (1.06–2.75)
Vascular/cardiac*		1.56 (0.80–3.05)
Bronchiectatic		2.70 (1.32–5.50)

*Not significant.

DISCUSSION

Despite analyzing mortality at multiple time-points, we were unable to define any utility of current IBW selection criteria for predicting mortality after lung transplantation. A potential criticism of prior studies that failed to show a survival disadvantage because of weight is that the obese population may have been the subject of selection bias—i.e., they may have been otherwise relatively robust, young, and well-appearing. Our inclusion of a group of patients presumed to have acceptable weight at the time of listing (the reclassified group) helps overcome this dilemma. Post hoc reclassification of this population renders selection bias highly unlikely. This study includes the largest cohort of overweight lung transplant recipients reported to date (46 patients $\geq$30 kg/m^2, 72 patients $\geq$130% IBW). In contrast, the only other study of long-term outcome included 10 patients $\geq$30 kg/m^2.[10]

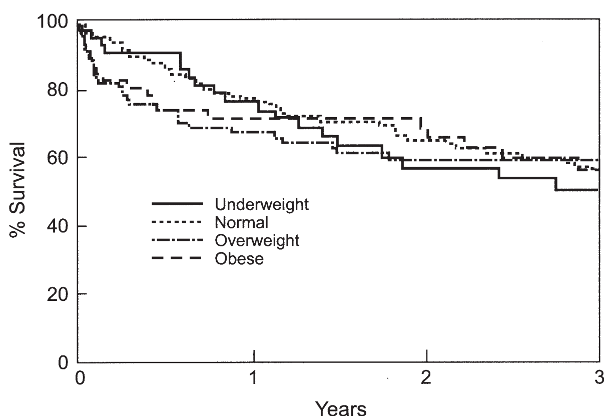

Figure 4. Kaplan-Meier survival curve for body mass index categories.

A number of transplant centers have adopted percent IBW as a convenient, reproducible index of obesity. It is assessed commonly on the basis of life insurance tables developed by the Metropolitan Life Insurance Company in the 1950s and updated in 1983.[15] The survival estimates were derived from a cohort of primarily middle-to-upper class, white, urban, healthy men 25 to 59 years old.[15] In common usage, no allowance is made for body type, although the original tables provide for 3 frame sizes: small, medium and large. The tables also have no adjustment for race, age, fat distribution, or presence of edema.[16]

When the most recent transplant guidelines were written,[12] the ISHLT chose IBW instead of BMI, based on the perception that it is more straightforward and easier to calculate (Maurer J, personal communication). The ISHLT has no specific recommendation about how to calculate IBW for this purpose. However, most studies of outcome in transplant patients have used BMI; IBW has been limited to few studies, none of which included lung transplant recipients or cut-points of 130%. In assessing individual cases, using BMI has similar limitations as using IBW. The choice of which obesity index is used for making clinical decisions has ramifications on the overall number, height, and sex of the lung transplant candidate pool. In comparison with the BMI, IBW is markedly more stringent for shorter heights in men and for all heights in women (Figures 5 and 6). For example, a 5-foot 1-inch woman would be required to have a BMI <26 kg/m^2 to be listed for lung transplantation under the current standard of 130%

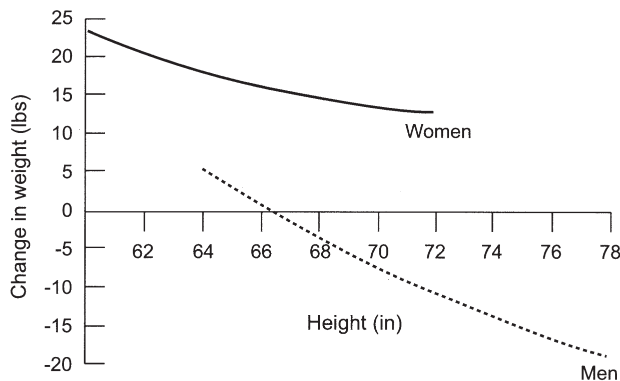

Figure 5. Comparison of excess weight allowed for each sex by a theoretical change to an upper limit of 30 mg/kg^2 by height. Note that for all heights, weight limits for women would be much less stringent. For men, a theoretical change to a body mass index 30 mg/kg^2 would result in fewer acceptable candidates. The effect would be particularly pronounced for tall men.

IBW. In contrast, taller men are relatively less likely to qualify for transplantation using BMI rather than IBW.

Although well validated for large-scale epidemiologic analyses, obesity indices may be misleading in individual circumstances. The distribution of body fat may be more relevant than the total quantity.[15] The presence of increased muscle mass or edema may erroneously suggest obesity, whereas malnutrition in elderly patients may mask its presence. For example, although BMI and %IBW were moderately correlated ($r = 0.70$) with percent body fat in a population of 363 healthy individuals, a large proportion of the population was misclassified by the height–weight indices.[17] In a larger cohort (5,072 men), BMI was correlated ($r = 0.78$) with skin-fold measurements of fat content, but in a significant proportion of individuals, the discrepancy between the two definitions of obesity was striking.[18] In cardiac transplant recipients, defining obesity by BMI misclassified 21% to 57% of patients, in comparison with a cutoff of 30% or 40% body fat as measured by bio-electrical impedance.[19]

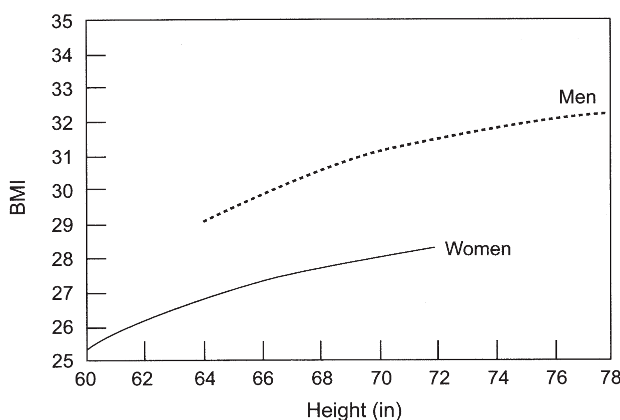

Figure 6. Body mass index (BMI) corresponding to 130% predicted ideal body weight for men and women. Note that by current standards, shorter women are excluded from transplantation even if they are only barely overweight by World Health Organization standards (BMI > 25 kg/m^2).

In general surgical patients, obesity has been associated with a longer length of stay[20] and with a weakly increased incidence of wound infections,[21] but has not corresponded consistently with increased mortality.[21,22] In large cohorts of cardiothoracic surgery patients (mainly coronary artery bypass), increased body weight correlates with an increased rate of peri-operative complications, but does not independently predict mortality unless there is extreme obesity (BMI > 40 kg/m^2).[23–25]

Studies of long-term survival in obese transplant recipients have yielded discrepant results; comparison of studies is confounded by widely varying definitions of obesity, length of follow-up, number of patients and selection biases. Similar to general surgical patients, obese cardiac,[26] liver,[27] and renal[28–31] transplant recipients have an increased incidence of peri-operative complications, especially wound infections. Some analyses also have suggested increased length of stay and overall cost.[11,27] A number of authors have reported a survival disadvantage in obese patients,[1–9] other studies have not found a significant effect.[26,27,29,31–39]

The largest studies to date have suggested that higher cutoffs may better predict outcome. In a review of 18,172 liver transplant recipients, only BMI > 40 conferred an increased odds ratio for death at 2 years (OR = 1.52); other obesity strata did not independently predict mortality.[4] For cardiac transplant recipients pre-operative weight >140% IBW was associated with increased mortality in a registry of 4,515 patients, but this study is difficult to interpret because a number of potential confounders were not controlled and the effect was apparent mainly in men aged >55 with underlying ischemic cardiomyopathy.[2] The largest cohort, including 51,927 renal allograft recipients, displayed a step-wise increasing relative risk for death (OR, 1.2–1.4) with interval increases of BMI >30 kg/m^2,[9] but the study did not control for pre-existing cardiovascular disease.

Some of the disparity in past studies of obesity may be due to differences in associated risk factors among populations of overweight patients. Several studies suggest that the increased risks of obesity accrue from excess cardiovascular disease and that its presence along with obesity may be a more important determinant of outcome.[4,31,40] For example, many of the studies that suggest that obesity is a risk factor for mortality have involved renal transplant recipients (a group with a high likelihood of cardiovascular disease).[5,7] However, rigorous pre-transplant cardiovascular screening in this population may negate any trend

toward worse survival.[29] Similarly, a large study of renal transplant recipients at the Cleveland Clinic Foundation concluded that excess weight-related mortality mainly is caused by concomitant cardiovascular disease, and the authors recommended weight restrictions only in the context of pre-transplant cardiac disease.[40] The lack of a long-term survival disadvantage in our obese patients may be because of our policy of aggressive pre-transplant screening for cardiovascular disease, along with ongoing post-transplant risk-factor modification.

Lung transplant candidates typically experience prolonged illnesses, with decreasing exercise capacity. The ability of these patients to lose a significant percentage of their body weight may be poor. Among renal transplant candidates required to attain a BMI <30 kg/m^2, only 10% lost any weight, with only 5% able to lose sufficient weight to qualify.[31] In our experience, despite the life-and-death implications of requirements to lose weight, not all patients can do so effectively.

In summary, we did not find any utility for current IBW strata in predicting mortality after lung transplantation. A particular strength of these data is the inclusion of a group of patients thought to be within acceptable weight limits at the time of listing. This reclassified group minimizes the possibility of selection bias. Consistent with prior reports,[11] the current study demonstrates an increase in early mortality (within 90 days) for lung transplant recipients with BMI ≥ 30 kg/m^2, but the risk seems tolerable when viewed in the context of long-term outcomes. Although a larger study may have revealed an influence on long-term outcomes, the current data suggest that such an effect would be small. Other recipient factors, such as age, sex, and race, have been shown here and by others[14] to have a greater impact on long-term survival, but they are not used to exclude patients from a potentially lifesaving procedure.

Clinical Inferences

Our data suggest that using increased body weight as a lone absolute contra-indication to lung transplant may be an overstatement of the available evidence. Ideal body weight did not predict short- or long-term mortality in our population. Body mass index was useful only for predicting short-term mortality. There should be a more in-depth discussion in the lung transplant community about the optimal criteria for assessing obesity. A larger sample size may better identify a specific inflection point for increased short- or long-term mortality. Until further study, however, it may be prudent to view mild-to-moderate obesity as among the relative contra-indications to lung transplantation, not as an absolute standard.

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