

## Editorial Article

# Robotic Assisted Kidney Transplant for the Obese, a Blessing or a Curse!

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## The Problem

Kidney transplant remains the gold standard treatment for End Stage Renal Disease (ESRD) patients. This is also true for obese patients, whereby kidney transplant, albeit lower, but still confers a significant survival advantage over dialysis (1,2). As of January 2017 there are over 98,000 patients on the United Network for Organ Sharing (UNOS) kidney transplant waiting list, approximately 37% of these are obese i.e. Body Mass Index (BMI) >30kg/m<sup>2</sup> (3). More than a third of this obese cohort is either severely (BMI >35kg/m<sup>2</sup>) or morbidly obese (BMI >40kg/m<sup>2</sup>). This is in keeping with the Centers for Disease Control and prevention (CDC) reported statistics of adult obesity rates of 36.5% in the United States (4). Obesity, a rising global epidemic, is considered to be an independent risk factor for cardiovascular disease. This is in addition to the association of obesity with diabetes, and dyslipidemia further potentiating the cardiovascular risk. Specific to kidney transplantation, cardiovascular events are a leading (42%) cause of mortality after a kidney transplant (5).

The US kidney transplant registry data shows that kidney transplants in patients with BMI greater than 35 kg/m<sup>2</sup> have a higher risk of graft failure and patient mortality alongside increased risk of Delayed Graft Function (DGF) and infections (6,7). This translates to longer hospital stay (7) adding further to the economic burden in care of obese kidney transplant patients. The Dialysis and Transplant Registry data of Australia and New Zealand also concludes that obesity is associated with poorer graft and patient survival in kidney transplant patients (8).

Therefore, although kidney transplantation, a better treatment option than dialysis for the obese ESRD patients, but when compared to the non-obese ESRD patients, they are riskier and poorer in outcomes. Therefore, the Scientific Registry of Transplant Recipients (SRTR) whilst collecting and analyzing outcome data of transplant centers in the United States, utilizes risk adjustment models to compensate for recipient risks for the transplant

centers. This reporting system minimizes the 'cream skimming' (9) behavior whereby providers could select the most profitable recipients i.e. the ones with minimal risk. But despite this risk adjustment model incorporating recipient BMI as an adjusted risk factor, obesity amongst ESRD patients still leads to a higher rate of denial of potential recipients during the pre-transplant evaluation phase (10).

Furthermore, after being listed for a kidney transplant, the likelihood of being bypassed for an organ offer by a provider is 4 to 13% higher for recipients with BMI 35-40 kg/m<sup>2</sup> and 22 to 23% higher for BMI >40 kg/m<sup>2</sup> (11). It therefore is no surprise that the median time to transplantation from listing, is significantly higher for patients with BMI >35 kg/m<sup>2</sup> (11).

## Robotic Assisted Kidney Transplant

Robotic Assisted Kidney Transplantation (RAKT) was first performed in France in 2001(12), but failed to garner enthusiasm as an alternative to open conventional approach in kidney transplant. The advantage of 'minimally invasive approach', that surgical robot offered in kidney transplant was limited in acceptance due to complex technique, steep learning curve and high costs associated with the Robot. Therefore, transplant centers developed and applied individual criterion for the use of Robot in kidney transplants.

Lately, RAKT is developing its niche in obese patients by certain practitioners. A comparative analysis of 28 patients with a mean BMI of 42.6±7.8 kg/m<sup>2</sup> in the study group of RAKT vs 38.1±5.4kg/m<sup>2</sup> BMI in the control arm of open conventional surgery for kidney transplant from living donors at a single center showed, Surgical Site Infections (SSIs) were significantly lower (0% vs 28.6%) in the robotic arm (13). Multivariate analysis by another group looking at SSIs in renal transplantation as a whole concluded that, BMI >30 kg/m<sup>2</sup> independently predicted incidence of SSI, and it turn SSI was a significant risk factor for graft loss and

approached near significance for patient mortality (14). Therefore, the promising results of RAKT in obese patients by Benedetti et al (13) albeit small in number were supportive of RAKT in obese ESRD patients, however they experienced higher incidence of Delayed Graft Function (DGF) and higher hospital costs associated with the Robotic device. It has been well known that DGF after kidney transplant is a predictor of poor long term graft and patient survival (15,16), and given the steep learning curve of RAKT, the anastomosis time is significantly longer. This in turn leads to DGF due to longer warm ischemic time. Therefore, RAKT on one hand is supportive of graft and patient survival by minimizing SSIs, on the other hand though, it negatively impacts, graft and patient survival due to the higher incidence of DGF. Therefore the acceptance of RAKT in obese patients, who inherently suffer worse graft and patient survival as compared to non-obese patients, is debatable.

The comparative study by Benedetti et al in comparing RAKT vs open surgery for obese patients also failed to show any impact on reducing the length of hospital stay with RAKT, despite the 'minimally invasive' advantage of the Robotic technique (13). However, one group did show reduced length of hospital stay and lower analgesic use with RAKT, but they utilized RAKT in non-obese patients, which is a whole different paradigm (17).

## Conclusion

RAKT, a relatively modern technique of kidney transplantation has been slow to gain momentum, despite being more than a decade old. Its application in obese recipients certainly minimizes SSIs, but adds to the incidence of DGF. Therefore, larger studies are needed to ascertain the impact of lower SSI vs higher DGF on patient and graft survival. We also need to ascertain the minimally invasive advantage of RAKT in reducing length of hospital stay and complications. This will better assess the balance of benefit vs risk with RAKT and which patients should advantage from it

Therefore in our opinion RAKT has certain, but limited application in kidney transplantation and therefore should require careful selection of patients as a prerequisite whilst considering RAKT.

**Conflict of Interest:** None

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