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Robotic Assisted Kidney Transplant, Reserved for the Deserved

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Abstract

Robotic assisted kidney transplant is the latest technical milestone in kidney transplant surgery. But, unlike other minimal invasive surgery, robotic kidney transplant has been slow to gain popularity despite the ergonomic advantage and lower wound complications, due to the costs involved, therefore questioning its true need in transplant surgery. Clearly the indications of robotic assisted kidney transplant are unclear, further debating its utility.

Obesity in kidney transplant has been steadily growing, in accordance with the rising obesity rates worldwide. Obesity leads to poor outcomes after any general surgical procedure due to the higher incidence of complications, and subsequently, negatively impacts graft and patient survival after a kidney transplant. Therefore, some of obese patients can significantly benefit with a robotic kidney transplant and therefore justify its utility and cost. Robotic kidney transplant is not here to replace the open conventional surgery, but rather act as an alternative tool, reserved to benefit certain patients only.

Keywords: Kidney transplant; Robotic assisted kidney transplant; Obesity; End stage renal disease; Living donor

Introduction

Kidney transplant has been the preferred treatment for End Stage Renal Disease (ESRD) patients, as it confers significant survival advantage, and is more cost-effective than chronic dialysis. The steep rise in kidney transplant waiting list has far outmatched the available kidney allografts. Therefore, in-tune with the utilitarian approach, the prioritization model of Kidney Allocation System [1] was enacted upon to permit an equitable system for the distribution of available kidneys for transplant. This new allocation system was also aimed to increase the life years gained from a kidney transplant by also allowing recipient factors to be considered when allocating a kidney from the donor pool. Therefore, appropriate recipient selection and matching is an important consideration to achieve optimal utility from the kidney allografts. Obesity amongst recipients whilst waiting for a kidney transplant poses not just technical challenges but also an ethical one. Should they be transplanted at all over a non-obese patient? If transplanted should they be subjected to the conventional open surgery versus minimal invasive technique for a better outcome? Finally, are the added costs of the minimal invasive approach, justified?

Obesity a growing problem

Obesity in United States is a major health concern, and has reached epidemic proportions, with more than a third of adults (34.9%) recorded by the Centers for Disease Control and prevention (CDC) as being obese [2]. On a similar distribution pattern, 37% candidates on the United Network of Organ Sharing (UNOS) kidney transplant waiting list are also obese, and a third of these obese candidates are either severely obese (BMI>35 kg/m^2), or morbidly obese (BMI>40 kg/m^2) [3].

Obesity in general, bears a strong independent correlation with higher patient mortality and also higher death censored graft loss after a kidney transplant [4]. The reasons behind the negative impact of obesity on kidney transplant outcomes are unclear. Therefore, due to the insufficient data, American Society of Transplantation (AST) practice guidelines are supportive of obese patients for receiving a kidney transplant [5]. On a further supporting note, kidney transplant from a deceased or a living donor in a obese patient also, confers significant survival advantage over dialysis, albeit at a lower rate when compared to a non-obese patient [6,7]. Therefore, obesity doesn't preclude patients from receiving a kidney transplant and it would be unethical to deny the opportunity of a transplant over dialysis purely based on BMI. But, it has been well observed in general surgical population, that obesity is associated with a higher percentage of surgical site infections (SSI) [8], this effect is also observed in obese kidney transplant patients [7]. SSIs in-turn lead to poor wound healing and therefore increases length of hospital stay and costly post-transplant care [4,7]. Furthermore, the graded rise in the frequency of SSIs with a kidney transplant is independently and significantly associated with increased graft loss at 3 years (HR 2.2, 95% CI: 1.36-3.55) [9]. Thus, the higher rate of graft loss in an obese patient, reduces life years gained from the kidney transplant in contrast to a non-obese candidate. Therefore, it is highly recommended that obese patients be educated and followed on a dietary regimen to help them lose weight [5] to still enjoy the benefits of a kidney transplant. But some patients are unable to lose weight either due to medical reasons or their obesity is refractory to conservative therapy. Bariatric surgery prior to transplant has played some role in reducing weight in preparation for a transplant [10], but morbidity and mortality is higher in dialysis patients undergoing bariatric surgery versus non-dialysis patients [11]. Therefore, technical innovations that can be implemented in obese ESRD population to improve patient outcomes after a kidney transplant, will allow equitability in access to transplantation.

Robotic assisted kidney transplantation

Minimal invasive surgery, since its first application in 1981, gained rapid popularity amongst patients and surgeons, thereby expanding its indications for use in the standard surgical procedures [12]. Robotic assistance in minimal invasive surgery, has offered added technical advantages of three-dimensional vision and articulated instruments with 7° of movements leading to the ease of suturing and better ergonomics.

Robotic Assisted Kidney Transplantation (RAKT) presents the latest innovation in the evolution of kidney transplant surgery. Hoznek, in 2001, described the first case of RAKT, whereby suturing was done using the robot, but was essentially an open operation in a non-obese patient [13]. However, it was not until 2009, RAKT was undertaken in an obese patient, wherein Benedetti et al. safely performed hand assisted robotic kidney transplant in a patient with BMI of 41 kg/m^2 [14]. The technical platform and the steps of the procedure were further described by Bhati et al. [15]. The same center in a comparative analysis of living donor kidney transplants in patients with a mean BMI of 42.6 ± 7.8 kg/m^2 undergoing RAKT, compared to a mean BMI of 38.1 ± 5.4 kg/m^2 in the control arm of open conventional surgery showed significantly lower SSIs (0% *vs.* 28.6%) [16]. SSIs have been independently associated with worse graft and patient outcomes after a kidney transplant [7,9].

Robotic assisted kidney transplant and obesity

Robotic Assisted Kidney Transplants have been practiced for almost two decades; however, logistical and financial barriers, in addition to unpredictability of outcomes has limited its broader implementation. The need for pneumoperitoneum in a RAKT, affecting renal flow post re-perfusion, along-with longer anastomosis times have increased Delayed Graft Function (DGF) rates when compared to open technique [16]. But whether this short rise in DGF affects long term transplant outcomes is unclear.

It is to be noted that the earlier RAKTs were performed in non-obese patients and therefore the benefits were not striking to gain the needed popularity, especially when considering the costs involved. However, considering obese patients who are disadvantaged with poor access to the available kidneys for transplant [17], RAKT sees a clear path for benefitting such patients with smaller incisions, reduced incidence of SSI, lower risk of incisional hernias and reduced postoperative analgesia requirement. There is also an improvement in postoperative complications including shortened length of hospital stay and postoperative respiratory infection secondary to immobility and pain from surgery.

A much needed, good systematic review comparing minimal invasive approach to open conventional surgery for kidney transplant has been difficult to conduct due to differing patient cohorts being selected for RAKTs, and studies with limited number of patients resulting in selection bias. Nonetheless, it has been observed that lower surgical complications in terms of postop hernia, lower SSI, better patient recovery and reduced postoperative analgesic use with minimal invasive approach benefits graft and patient outcomes [18].

The outcome of RAKT in patients with BMI > 40 kg/m^2 when compared to the UNOS registry data, have also been comparable on both graft and patient survival [19].

Conclusion

Obese ESRD patients are clearly disadvantaged due to poor access for kidney transplant and have higher risks of graft and patient loss following transplant. But, there is a significant survival advantage with a kidney transplant over dialysis, therefore it would be unethical to deny an obese patient the preferred choice of a transplant similar to a non-obese ESRD patient.

As the experience of transplant center advances, RAKT would see a developing need in obese recipients, given the obesity epidemic, in order to achieve similar graft and patient survival as non-obese patients. RAKT would therefore be a technique reserved for some obese patients to allow equitability in kidney transplantation. The learning curve with RAKT is minimal with previous robotic training [20] and the rising cohort of obese patients on the kidney transplant waiting list makes the argument stronger for RAKT.

We understand that RAKT is a very advanced and therefore costly technique in terms of the robot cost and the expense of disposables used; and to utilize it to perform a procedure that has been safely practiced for decades via open technique are two of its biggest challenges. However, when considering rising hospital costs and low availability of hospital beds including the extreme shortage of kidney allografts for transplants, it is imperative from health care economics to invest in the technique and training for RAKT. Therefore, from a financial perspective along with supporting utility and justice in kidney allograft allocation and transplantation, RAKT should be reserved for a selected group of patients who are obese and do not, and cannot benefit from weight loss programs including bariatric surgery.

Conflict of Interest

The Authors declares there are no Conflicts of Interest regarding the publication of this article.

References

1. Organ Procurement and Transplantation Network.
2. Ogden CL, Carroll MD, Kit BK, Flegal KM (2014) Prevalence of childhood and adult obesity in the United States, 2011–2012. JAMA 311: 806-814.
3. Batra RK (2017) Robotic Assisted Kidney Transplant for the Obese, a Blessing or a Curse! J Urol Ren Dis: J124.
4. Meier-Kriesche HU, Arndorfer JA, Kaplan B (2002) The impact of body mass index on renal transplant outcomes: a significant independent risk factor for graft failure and patient death. Transplantation 73: 70-74.
5. Kasiske BL, Cangro CB, Hariharan S, Hricik DE, Kerman RH, et al. (2001) The evaluation of renal transplantation candidates: clinical practice guidelines. Am J Transplant 1(suppl 2): 3-95.
6. Glanton CW, Kao TC, Cruess D, Agodoa LY, Abbott KC (2003) Impact of renal transplantation on survival in end-stage renal disease patients with elevated body mass index. Kidney Int 63: 647-653.
7. Lentine KL, Delos SR, Axelrod D, Schnitzler MA, Brennan DC, et al. (2012) Obesity and Kidney Transplant Candidates: How Big Is Too Big for Transplantation? Am J Nephrol 36: 575-586.
8. Winfield RD, Reese S, Bochicchio K, Mazuski JE, Bochicchio GV (2016) Obesity and the Risk for Surgical Site Infection in Abdominal Surgery. Am Surg 82: 331-336.
9. Lynch RJ, Ranney DN, Shijie C, Lee DS, Samala N, et al. (2009) Obesity, surgical site infection, and outcome following renal transplantation. Ann Surg 250: 1014-1020.
10. Modanlou KA, Muthyala U, Xiao H, Schnitzler MA, Salvalaggio PR, et al. (2009) Bariatric surgery among kidney transplant candidates and

recipients: analysis of the United States renal data system and literature review. Transplantation 87: 1167-1173.

11. Andalib A, Aminian A, Khorgami Z, Navaneethan SD, Schauer PR, et al. (2016) Safety analysis of primary bariatric surgery in patients on chronic dialysis. Surg Endosc 30: 2583-2591.
12. Semm K (1983) Endoscopic appendectomy. Endoscopy 15: 59-64.
13. Hoznek A, Zaki SK, Samadi DB, Salomon L, Lobontiu A, et al. (2002) Robotic assisted kidney transplantation: an initial experience. J Urol 167: 1604-1606.
14. Giulianotti P, Gorodner V, Sbrana F, Tzvetanov I, Jeon H, et al. (2010) Robotic transabdominal kidney transplantation in a morbidly obese patient. Am J Transplant 10: 1478-1482.
15. Bhati C, Jeon H, Oberholzer J, Tzvetanov T, Benedetti E (2011) 11th Annual State of the Art Winter Symposium. January 13-16, 2011. Am J Transplant Suppl 1: 50-95.
16. Oberholzer J, Giulianotti P, Danielson KK, Spaggiari M, Bejarano PL, et al. (2013) Minimally invasive robotic kidney transplantation for obese patients previously denied access to transplantation. Am J Transplant 13: 721-728.
17. Segev DL, Simpkins CE, Thompson RE, Locke JE, Warren DS, et al. (2008) Obesity impacts access to kidney transplantation. J Am Soc Nephrol 19: 349-355.
18. Wagenaar S, Nederhoed JH, Hoksbergen AWJ, Bonjer HJ, Wisselink W, et al. (2017) Minimally Invasive, Laparoscopic, and Robotic-assisted Techniques Versus Open Techniques for Kidney Transplant Recipients: A Systematic Review. Eur Urol 72: 205-217.
19. Garcia-Roca R, Garcia-Aroz S, Tzvetanov I, Jeon H, Oberholzer J, et al. (2017) Single center experience with robotic kidney transplantation for recipients with BMI of 40 kg/m^2 or greater: a comparison with the UNOS Registry. Transplantation 101: 191-196.
20. Sood A, Ghani KR, Ahlawat R, Modi P, Abaza R, et al. (2014) Application of the Statistical Process Control Method for Prospective Patient Safety Monitoring During the Learning Phase: Robotic Kidney Transplantation with Regional Hypothermia (IDEAL Phase 2a–b). Eur Urol 66: 371-378.