ORİJİNAL ARAŞTIRMA ORIGINAL RESEARCH

DOI: 10.5336/urology.2020-76617

New Incision Method for Kidney Transplantation: Single-Center Experience

Böbrek Naklinde Yeni Bir İnsizyon Metodu: Tek Merkez Deneyimi

Ahmet HACIİSLAMOĞLU[a], Yusuf ARIKAN[a], İsmail EVREN[a], Mithat EKŞİ[b], Murat TÜKEN[a], Serdar KARADAĞ[a], Deniz Noyan ÖZLÜ[a], Ahmet Faysal GÜLER[a]

[a]University of Health Sciences Bakırköy Dr. Sadi Konuk Training and Research Hospital, İstanbul, TURKEY
[b]Department of Urology, Arnavutköy State Hospital, İstanbul,TURKEY

ABSTRACT Objective: Despite such difficulties and the presence of minimally invasive techniques, open kidney transplant is still a popular method in many clinics worldwide. We tried to identify our incision for kidney transplantation, to present the anatomical limits of the incision and to discuss its advantages-disadvantages. **Material and Methods:** Patient selection: Ages, number of living donors-cadaver donors, anastomosis durations, operation durations, surgical incision length, surgical site circumference, post-op incisional hernia rate and presence of wound site infection were noted for the 77 patients included. Surgical Technique: After the transverse line drawn at the umbilicus level, a line connecting umbilicus and spina iliaca anterior superior (SIAS) is drawn. The center of the umbilicus-SIAS line is the lateral edge of the rectus abdominis muscle. The endpoint of our incision is 1-2 cm superior to the junction of the tuberculum pubicum with the rectus muscle. **Results:** Sixty nine of these kidney transplantations (89.6%) were from living and 8 were (10.3%) from cadaver donors. For transplants from a living donor, mean anastomosis duration was 31,8±7.3 min and mean operation duration was 150.6±27 min. For cadaver donors, mean anastomosis duration was 29.6±4.4 min and the mean operation duration was 137±33 min. Post-operative wound site infection was observed in 7 (9.1%) patients in 77 kidney transplantation operations. The postoperative incisional hernia was observed in 7 patients (9.1%). **Conclusion:** Our incision, named as renal transplantation incision, can reach the surgical site without damaging the anatomic layers and present a quite good view of the surgical site. To provide better evaluation, applications with a higher number of patients are needed.

Keywords: Kidney transplantation; surgical wound site

ÖZET Amaç: Pek çok zorluğuna ve minimal invaziv tekniklerin varlığına rağmen, açık böbrek nakli hala dünya genelinde birçok klinikte popüler bir yöntemdir. Biz bu yazımızda, böbrek nakli için kullandığımız kesiyi belirlemeye, kesinin anatomik sınırlarını açıkça ortaya koymaya, avantaj ve dezavantajlarını tartışmaya çalıştık. **Gereç ve Yöntemler:** Hasta seçimi: Dahil edilen 77 hastanın, yaşları, canlı donör-kadavra donör sayısı, anastomoz süreleri, operasyon süreleri, cerrahi insizyon uzunluğu, cerrahi alanın daire çevresi, ameliyat sonrası insizyonel herni oranı ve yara yeri enfeksiyonu varlığı kaydedildi. Cerrahi teknik: Umblikus hizasından çekilen transvers çizgi sonrası umblikus ile spina ilyaka anterior superioru (SIAS) birleştiren çizgi çekilir. Umblikus-SIAS çizgisinin ortası rektus abdominis kasının lateral kenarıdır. İnsizyonumuzun bitiş yeri tuberculum pubicum'un rektus kası ile birleşim yerinin 1-2 cm superiorudur. **Bulgular:** Böbrek nakillerimizin 69 (%89,6)'u canlı donörden, 8 (%10,3)'i kadavra donörden yapılmıştır. Canlı donörden nakiller için; ortalama anastomoz süresi 31,8±7,3 dakika ve ortalama operasyon süresi 150,6±27 dakikaydı. Kadavra donörden nakiller için; ortalama anastomoz süresi 29,6±4,4 dakika ve ortalama operasyon süresi 137±33 dakikaydı. 77 böbrek nakli operasyonundan, 7 hastada (%9,1) ameliyat sonrası yara yeri enfeksiyonu gözlendi. Postoperatif insizyonel herni ise 7 hastada (%9,1) gözlendi. **Sonuç:** Renal transplantasyon insizyonu adını verdiğimiz insizyonumuz, operasyon alanına anatomik katmanları bozmadan ulaşarak, operasyon alanını oldukça iyi bir şekilde gösterebilmektedir. Daha iyi değerlendirilebilmesi için daha çok hasta ile uygulamalara ihtiyaç vardır.

Anahtar Kelimeler: Böbrek nakli; cerrahi yara yeri

Kidney transplantation in the treatment of end-stage kidney disease is still widely preferred worldwide as the gold standard method. It is a complex procedure due to many different causes such as the presence of factors like obesity which makes the surgery difficult, frequent anticoagulant use, the presence of long-term dialysis treatment-related metabolic problems, pre-operative use of immunosuppressive agents and possibility of graft rejection. Despite such difficulties and developed minimally invasive techniques, open kidney transplantation remains popular in many clinics around the world.[1-6]

Correspondence: Deniz Noyan ÖZLÜ
University of Health Sciences Bakırköy Dr. Sadi Konuk Training and Research Hospital, İstanbul, TURKEY/TÜRKİYE
E-mail: noyanozlu@hotmail.com

Peer review under responsibility of Journal of Reconstructive Urology.

Received: 23 May 2020 ***Received in revised form:*** 18 Aug 2020 ***Accepted:*** 07 Sep 2020 ***Available online:*** 22 Dec 2020

OBJECTIVE

Kidney transplantation is the gold standard method in the treatment of end-stage renal failure. In recent years, especially with the increasing number of living donors, minimally invasive techniques have become more popular in kidney transplantation, as in many surgical procedures. Ratner et al. performed laparoscopic donor nephrectomy (LDN) in 1995 for the first time; bleeding, need for postoperative analgesia and hospital stay were less and better cosmetic outcomes compared to open donor nephrectomy were acquired.[7] Today, LDN is applied as the standard procedure for living donor nephrectomy.[8] In 2002, Horgan et al. reported the clinical application of robot-assisted laparoscopic donor nephrectomy (RND) for the first time.[9] In 2015, laparoscopic kidney transplant (LKT) was defined, and in 2016, robot-assisted kidney transplant (RAKT) was defined. In contrast, many kidney transplant recipients are still operated through traditional incisions using the Gibson incision (GIBI) or hockey-stick incisions (HSI).[10-13] Like other defined incisions including these two incisions; midline incision, modified Pfannenstiel incision, short transverse incision are not specific for kidney transplantation. Instead of these incisions modified for kidney transplantation, we tried to define the incision which we could call as renal transplant incision, clearly present the anatomic borders of the incision, and discuss its advantages and disadvantages.

MATERIAL AND METHODS

PATIENT SELECTION

Ages, number of living donors-cadaver donors, anastomosis durations, operation durations, surgical incision length, surgical site circumference, post-op inguinal hernia rate and presence of wound site infection were noted for the 77 patients included in the study (Table 1). Surgical area circumference was calculated as previously stated in the literature.[14] The study was carried out in compliance with the Helsinki Declaration.

SURGICAL TECHNIQUE

After the transverse line drawn at the umbilicus level, a line connecting umbilicus and spina iliaca anterior superior (SIAS) is drawn. The center of the umbilicus-SIAS line is the lateral edge of the rectus abdominis muscle. The length of our incision is planned to be equal to the donor kidney size in recipients with body mass index (BMI) <30 kg/m^2 and 2 cm longer than the donor kidney size in patients with BMI 30>kg/m^2. The endpoint of our incision is 1-2 cm superior to the junction of the tuberculum pubicum with the rectus muscle. The starting point of the incision is the point where the bisector of the angle formed by the transverse line drawn from the umbilicus and the umbilicus-SIAS line intersects the lateral of the rectus muscle. Skin can be incised from the lateral of rectus muscle or can be parallel to this line and 1-2 cm more lateral (Figure 1). Following skin incision, subcutaneous tissues are cut with scissors and cautery. Oblique externus fascia is cut, and the front and rear sheath fascia of the rectus is also cut. Meanwhile the rectus muscle is preserved. In this way, retroperitoneum is reached (Figure 2). Inferior epigastric artery and vein are ligated and cut. Funiculus spermaticus is preserved in men. In women, ligamantum teres uteri is ligated and cut.

TABLE 1: Demographic, preoperative, peroperative and postoperative data.

N:77	
Age (years) (mean±SD)	43.6±8.7
Renal transplantation (n; %)	
Living donor	69 (89,3%)
Cadaveric	8 (10,3%)
Anastomosis duration (Living donors) (min) (mean±SD)	
Artery	13.7±4.6
Vein	17.4±6.6
Total	31.8±7.3
Anastomosis duration (Cadaveric donors) (min) (mean±SD)	
Artery	12.8±3.9
Vein	16.5±4.6
Total	29.6±4.4
Operation duration (Living donors) (min) (mean±SD)	150.6±27
Operation duration (Cadaveric donors) (min) (mean±SD)	137±33
Surgical incision length (Living donors) (cm) (mean±SD)	11.9±2.1
Surgical incision length (Cadaveric donors) (cm) (mean±SD)	10.1±1.4
Surgical site circumference (Living donors) (cm) (mean±SD)	35.7±6
Surgical site circumference (Cadaveric donors) (cm) (mean±SD)	30.1±5.2
Complication (n%)	
Wound site infection	7 (9.1%)
Incisional hernia	7 (9.1%)

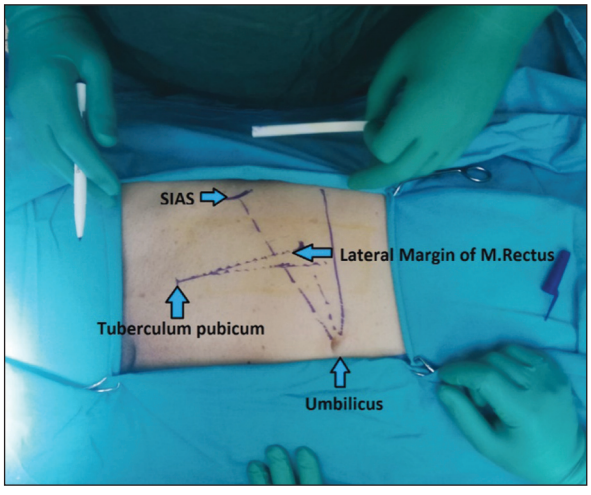

FIGURE 1: Anatomical reference points of incision and incision line.

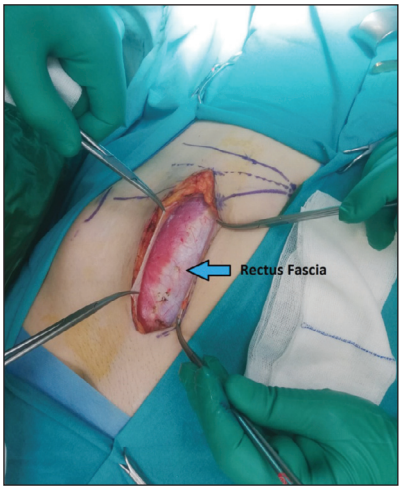

FIGURE 2: Preserving the rectus muscle by passing the fascia of the rectus muscle.

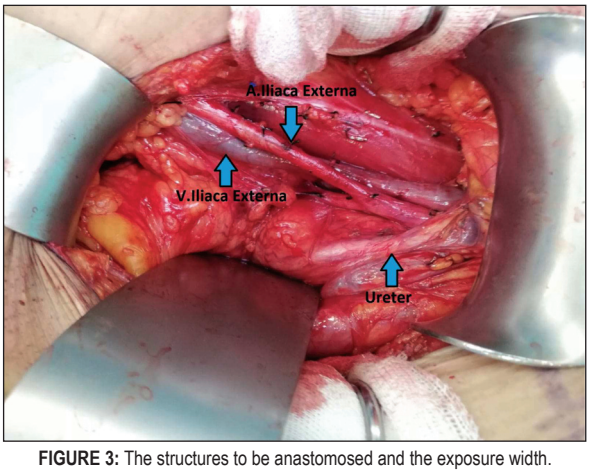

FIGURE 3: The structures to be anastomosed and the exposure width.

FIGURE 4: Length of incision.

As a result, external iliac vein and artery are reached (Figure 3). Figure 4 shows the length of the incision and the postop view.

RESULTS

The present study was conducted according to the principles of the 2008 Helsinki Declaration. After taking the consent of the ethics board, data were retrospectively examined for 97 kidney transplantations performed due to end-stage renal failure by the same surgeon in our clinic between 2018 and 2019. Seven patients were re-operated in the early postoperative period due to vascular pathologies. This incision was not used in five patients due to the requirement of concurrent native nephrectomy. Six patients had two or more arteries. Two patients refused the examination of their data. These 20 patients were excluded from the study. Seventy seven homogenous patients were included in the study (Table 1). The mean age of kidney transplant patients performed by our transplant clinic was 43.6±8.7 years. Sixty nine of these kidney transplantations (89.6%) were from living and 8 were (10.3%) from cadaver donors. For transplants from a living donor, mean anastomosis duration was 31.8±7.3 min (13.7±4.6 artery min, 17.4±6.6 min vein anastomosis) and mean operation duration was 150.6±27 min. For transplants from a cadaver donor; mean anastomosis duration was 29.6±4.4 min (12.8±3.9 min artery, 16.5±4.6 min vein) and the mean operation duration

was 137±33 min. Surgical incision length was 11.9±2.1 cm in kidney transplants from a living donor and 10.1±1.4 cm in kidney transplants with kidneys taken from cadaver. Surgical site circumference was registered as 37.7±5.1 cm from the transplantations performed with kidneys of living donors and as 33.1±5.2 cm those performed with kidneys taken from cadavers. Post-operative wound site infection was observed in 7 (9.1%) patients in 77 kidney transplantation operations. While 5 of these patients recovered completely after two weeks of antibiotic treatment, 1 patient underwent surgical debridement. The postoperative incisional hernia was observed in 7 patients (9.1%). Primary repair was performed in all these patients.

DISCUSSION

The gold standard treatment in end-stage kidney disease is kidney transplantation. Kidney transplantation involves many difficulties, such as being performed in a limited surgical field, the presence of many additional diseases of patients, the presence of agents such as immunosuppressants given before the operation, and the use of anticoagulants for most patients. Thus, graft and patient survival are the most important postoperative outcomes.[15]

Many techniques have been tried and published for kidney transplantation. Although the most commonly used techniques are GIBI and HIS; but midline incision, minimal invasive kidney transplantation, minimally invasive video-assisted kidney transplantation, kidney transplantation with modified skin incision, minimal access kidney transplantation, kidney transplantation with modified Pfannenstiel incision and laparoscopic and robotic assisted kidney transplantation are also used. Despite the development of so many minimally invasive methods, open techniques are still widely used by many clinics. Relatively short learning curve, inexpensive equipment and good overview of the surgical site are among the possible causes of this condition.[16]

We shared the results of 77 kidney transplantations we performed with skin incision named as renal transplantation incision. Our most important advantage is that we respect the anatomical plans, the width of the exposure in the anastomosis area, and thus the ease of anastomosis. In addition, in the GIBI and HSI incision, which is the most used method in kidney transplantation all over the world, we think that the borders of the incision have not been determined clearly and cutting the external oblique muscles while reaching the anastomosis area after the incision means disruption of the anatomical integrity.

The length of skin incision in our technique is longer than the newly defined techniques aimed at minimal invasion, but it is not different from standard techniques compared to classical methods. Melinka et al. reported the incision length in the kidney transplantation applied through HSI as 17.5±3.1 cm. In their series of 66 patients, 6 (9.1%) patients had delayed wound healing or infection at the wound site.[14] Although surgical skin incision length provides a risk of wound infection in transplantation procedure which is already complicated enough, but with the 9.1% we reached, the results are that this risk does not increase.

The weakest point of the method we described is that the probability of inguinal hernia increases slightly due to the exposure we make using the cavity of the abdominal anatomy. Nanni et al. reported incisional hernia ratios as 4% in GIBI and 16% in HIS.[17] According to Melinka et al., the rate of incisional hernia with a short transverse incision was 6%, while it was 9.1% with HIS.[14] Our incisional hernia rate is similar to the HSI incision but higher compared to the GIBI incision.

One of the major limitations is the number of patients. As the number of applications increases, a better evaluation will be made. In addition, examination of patient-related factors such as postoperative pain and quality of life will increase the comparability of our incision with other incisions.

CONCLUSION

Our incision, named renal transplantation incision, can reach the surgical site without damaging the anatomic layers and present a quite good view of the surgical site. To provide better evaluation, applications with a higher number of patients are needed.

Source of Finance

During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: *Ahmet Hacıislamoğlu, Serdar Karadağ, Ahmet Faysal Güler;* ***Design:*** *Ahmet Hacıislamoğlu, Yusuf Arıkan, Mithat Ekşi;* ***Control/Supervision:*** *Ahmet Faysal Güler, Serdar Karadağ, Murat Tüken, İsmail Evren;* ***Data Collection and/or Processing:*** *Deniz Noyan Özlü, Yusuf Arıkan, Mithat Ekşi;* ***Analysis and/or Interpretation:*** *Ahmet Faysal Güler, Yusuf Arıkan, Mithat Ekşi, Serdar Karadağ, İsmail Evren;* ***Literature Review:*** *Ahmet Hacıislamoğlu, Deniz Noyan Özlü,, İsmail Evren, Yusuf Arıkan, Serdar Karadağ;* ***Writing the Article:*** *Ahmet Hacıislamoğlu, Yusuf Arıkan, Mithat Ekşi, Deniz Noyan Özlü;* ***Critical Review:*** *Mithat Ekşi, Deniz Noyan Özlü, Serdar Karadağ, İsmail Evren, Murat Tüken;* ***References and Fundings:*** *Ahmet Hacıislamoğlu, Serdar Karadağ, Murat Tüken;* ***Materials:****hmet Faysal Güler, Serdar Karadağ, İsmail Evren, Murat Tüken.*

REFERENCES

1. Cinqualbre J, Kahan BD. René Küss: fifty years of retroperitoneal placement of renal transplants. Transplant Proc. 2002;34(8): 3019-25. [Crossref] [PubMed]
2. Øyen O, Scholz T, Hartmann A, Pfeffer P. Minimally invasive kidney transplantation: the first experience. Transplant Proc. 2006;38(9): 2798-802.[Crossref] [PubMed]
3. Oberholzer J, Giulianotti P, Danielson KK, Spaggiari M, Bejarano-Pineda L, Bianco F, ET AL. Minimally invasive robotic kidney transplantation for obese patients previously denied access to transplantation. Am J Transplant. 2013;13(3):721-8.[Crossref] [PubMed] [PMC]
4. Kishore TA, Shetty A, Tharun BK, John EV, Bhat S. Renal transplantation through a modified non-muscle-cutting Pfannenstiel incision. Int Urol Nephrol. 2014;46(5):901-4.[Crossref] [PubMed]
5. Kiberd B, Panek R, Clase CM, MacDonald AS, McAlister V, Belitsky P, et al. The morbidity of prolonged wound drainage after kidney transplantation. J Urol. 1999;161(5): 1467-9.[Crossref] [PubMed]
6. Ho D, Lynch RJ, Ranney DN, Magar A, Kubus J, Englesbe MJ. Financial impact of surgical site infection after kidney transplantation: implications for quality improvement initiative design. J Am Coll Surg. 2010;211(1): 99-104.[Crossref] [PubMed]
7. Ratner LE, Montgomery RA, Kavoussi LR. Laparoscopic live donor nephrectomy. A review of the first 5 years. Urol Clin North Am. 2001;28(4):709-19.[Crossref] [PubMed]
8. Dols LF, Kok NF, Ijzermans JN. Live donor nephrectomy: a review of evidence for surgical techniques. Transpl Int. 2010;23(2):121-30.[Crossref] [PubMed]
9. Horgan S, Vanuno D, Benedetti E. Early experience with robotically assisted laparoscopic donor nephrectomy. Surg Laparosc Endosc Percutan Tech. 2002;12(1):64-70.[Crossref] [PubMed]
10. Rocca X, Espinoza O, Hidalgo F, Gonzalez F. Laparoscopic nephrectomy: safe and comfortable surgical alternative for living donors and for good results of graft function. Transplant Proc. 2005;37(8):3349-50.[Crossref] [PubMed]
11. Greco F, Hoda MR, Alcaraz A, Bachmann A, Hakenberg OW, Fornara P. Laparoscopic living-donor nephrectomy: analysis of the existing literature. Eur Urol. 2010;58(4):498-509. [Crossref] [PubMed]
12. Modi P, Pal B, Kumar S, Modi J, Saifee Y, Nagraj R, et al. Laparoscopic Transplantation Following Transvaginal Insertion of the Kidney: Description of Technique and Outcome. Am J Transplant. 2015;15(7):1915-22.[Crossref] [PubMed]
13. Doumerc N, Roumiguié M, Rischmann P, Sallusto F. Totally robotic approach with transvaginal insertion for kidney transplantation. Eur Urol. 2015;68(6):1103-4.[Crossref] [PubMed]
14. Malinka T, Banz VM, Wagner J, Candinas D, Inderbitzin D. Incision length for kidney transplantation does not influence short- or long-term outcome: a prospective randomized controlled trial. Clin Transplant. 2013;27(5): E538-45.[Crossref] [PubMed]
15. Giblin L, O'Kelly P, Little D, Hickey D, Donohue J, Walshe JJ, et al. A comparison of long-term graft survival rates between the first and second donor kidney transplanted-the effect of a longer cold ischaemic time for the second kidney. Am J Transplant. 2005;5(5):1071-5. [Crossref] [PubMed]
16. Starzl TE, Marchioro TL, Morgan WW, Waddell WR. A technique for use of adult renal homografts in children. Surg Gynecol Obstet. 1964;119:106-8.[PubMed] [PMC]
17. Nanni G, Tondolo V, Citterio F, Romagnoli J, Borgetti M, Boldrini G, et al. Comparison of oblique versus hockey-stick surgical incision for kidney transplantation. Transplant Proc. 2005;37(6):2479-81.[Crossref] [PubMed]