

Case Report

Successful Kidney Transplantation in an Advanced Elderly at Federal Medical Center Abuja: A Case Presentation

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Abstract

Background: Kidney transplantation (KTP) in elderly can be challenging with fears of mortality that is unrelated to surgery. Generally, elderly patients are defined as individuals aged 65 years and older. These group of individuals has been further subdivide unto ‘early elderly’ or ‘late elderly’. KTP is a form of stress which invariably triggers off significant impactful metabolic response in these group of weak and delicate individuals. **Objective:** End stage renal disease (ESRD) occurs in all age groups and the prevalence increases with aging due to associated comorbid conditions like diabetes mellitus (DM) and hypertension. This co-morbidities are confirmed etiology of ESRD. The aim of this case presentation is to emphasize that age is not an absolute contraindication to KTP. The emphasis should rather dwell on careful patient selection, good surgical techniques as well as adequate post-operative care and follow up. **Conclusion:** We report a case of an 81 year old male patient with ESRD secondary to long term DM and hypertension who had kidney transplantation in our facility with impressive outcome. We had our fears prior to KTP as per advanced age, drug burden and compliance despite excellent HLA typing and cross matching. However we were able to navigate these challenges by use of branded immunosuppressive drugs, living related donor, good surgical techniques, regular follow up as well as engaging a domiciliary care giver in order to ensure strict drug compliance while envisaging long term graft survival.

Keywords

Kidney Transplantation, End Stage Renal Disease, Elderly, Hemodialysis, Quality of Life

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1. Introduction

An elderly is an individual aged 65 and older. Kidney transplantation (KTP) is a form of stress which triggers off significant impactful metabolic response in these group of weak and delicate individuals. End stage renal disease (ESRD) occurs in all age groups and the prevalence increases with aging due to associated comorbid conditions like diabetes mellitus (DM) and hypertension which are confirmed etiology of ESRD. [1] While patient survival is lower in elderly compared to the younger kidney recipients, KTP in the elderly patient remains worthwhile as these patients benefit from a reduction in morbidity and mortality rate with improved quality of life (QoL) compared with other forms of renal replacement therapy (RRT) including hemodialysis. [2] Immunologic, economic, psychosocial as well as the underlying etiology like DM, renal parenchymal disease, bladder outlet obstruction and hypertension influence the overall outcome of KTP in the elderly and should be recognized in the care of the elderly patients after KTP. [1, 2].

Generally, elderly patients are defined as individuals aged 65 years and older. These group of individuals has been further subdivide unto 'early elderly' or 'late elderly'. While those from 65-74 years are referred to as "early elderly", individuals over 75 years are referred to as "late elderly". [3] According to the WHO, chronological old age of 65-74 years is referred to as 'young elderly' who are in a transition period from working life to retirement while the chronological age of 75-85 years referred to as 'advanced elderly' where functional losses begins to be observed. Those above 85 years and older are 'very advanced elderly' needing special care and support. [4].

Survival benefits of KTP remains most pronounced in younger patients with ESRD, elderly patients still gained improved QoL after KTP compared to hemodialysis and further recommended KTP as treatment of choice for ESRD in elderly patients with favorable performance status. [5] There is a rising trend of KTP amongst patients older than 65 years in United States and by 2006, elderly patients accounted for 13.3% of all kidney transplant recipients. [6] It is recommended that only a limited number of elderly patients with ESRD should be considered for KTP as many may not be psychologically stable with decreased interest especially when they are properly counseled on possible turbulent post KTP care and lifelong protocol. [1] Due to the increase in life expectancy, elderly patients coming for KTP has been exponentially significant over the years. The benefits of KTP compared to hemodialysis in terms of survival and improved QoL in elderly can be satisfactory with proper patient selection via rigorous cardiovascular evaluation, neoplastic assessment as well as assessment of performance status and peculiarities of the index patient. While age remains a limiting factor for the access to the waiting list, the reluctance of the physicians can be linked to the various comorbid conditions of these elderly patients, limited life expectancy as well as the

paucity of graft. It has being established that living donor remains ideal for elderly recipients with the alternative being the extended criteria donor which invariably reduces the waiting time in this group of delicate patients. Emphasized on the choice and brand of immunosuppressive protocol is also important due to the high risk of infectious and cardiovascular events triggering various forms of rejection with accompanying severe consequences. [7].

Despite a safe and good graft survival, the mortality rate in elderly recipients remains significant. The cause of death were infections in 42%, malignancy in 23%, cardiovascular events in 14%, cerebrovascular disease in 7%, and unknown in 14%. The most common cause of death in males was infections (52%) while the most common cause in females was tumors (55%). At 1, 3, 5, and 10 years, overall patient survival rate in this elderly population was 89%, 84%, 72%, and 45% with overall graft survival of 100%, 97%, 89%, and 84%, respectively. [8] The results of KTP in elderly are inferior to those observed in younger patients and often death occurs despite functioning graft. [9] Being elderly should not be an absolute contraindication to KTP because of evidence based longer life expectancy with improved QoL and discontinuation of dialysis following KTP. [2] Moreso, KTP and surgery in majority of cases was not the cause of death but other concomitant factors with infection topping the list. [8] Increasing age, severity of cardiac events as well as other diseases makes it inevitable to consider other indices which may be helpful in identifying high risk patients. Patient's selection is vital with focus on the degree of frailty, presence of comorbid conditions including DM and hypertension as well as cognitive ability to effectively and religiously adhere to post KTP drug burden. The critical point remains the unintentional poor compliances to post KTP medications most probably due to dementia or poor cognition associated with aging. This has serious untoward effect on the graft survival which will be observed early with evidenced by deranged renal function particularly urea and creatinine. Aside forgetfulness in adhering to post KTP drugs, the high drug burden and number of pills as well as modification of the dosage or type of prescriptions post KTP may contribute to the poor adherence and confusion which invariably impact on the graft survival. Careful screening of the presence and degree of frailty, various comorbid conditions and cognitive dysfunction with consequent poor compliance to post KTP drugs cannot be overemphasized prior to considering these group of weak and delicate individuals for KTP. [9].

Kidney transplantation outcomes in elderly remains controversial with less than a year re-hospitalization of 39.5% with high infectious complications of 18.4% and overall mortality rate of 23.1%. [10] Silva RM et al reported that the high mortality rate has a positive correlation with factors related to surgery such as cold ischemia time, increasing donor age as well as factors related to the recipients such as

pre-transplantation duration of dialysis, cardiovascular disease, delayed graft function, early cardiovascular complications after KTP and early re-hospitalizations. [10] A more rigorous pre-transplant evaluation focusing on comorbid conditions with strict exclusion criteria, excellent complete and inclusive HLA typing and cross matching, 'top notch' experienced surgical and medical team as well as strict adherence to protocols is vital to successful KTP in advanced elderly patients. [17, 18] Elderly patients obviously benefit from a KTP despite multiple comorbidities. Elderly patients who remain on dialysis on average die earlier compared to patients who had KTP. [16] Elderly also experience a significant improvement in the QoL after KTP. The emphasis remain on detailed evaluation to assess the individual benefits to KTP in these group of patients. Compared to deceased donor graft, living donor kidney will most likely function spontaneously with long term graft survival. [1, 16].

We report a case of an 81 year old male patient with ESRD secondary to long term DM and hypertension who had kidney transplantation in our facility with impressive outcome evidenced by improved renal function and discontinuation of hemodialysis. We had our fears prior to KTP as per advanced age, drug burden and compliance despite excellent HLA typing and cross matching. However with effectiveness in certain key factors including excellent living related donor compatibility, use of branded immunosuppressive drugs, good surgical techniques as well as regular follow up we were able to address emerging challenges while envisaging long term graft survival.

2. Case Presentation

He is an 81 year old male patient who presented to our facility with hiccups, leg swelling, nausea, vomiting and deranged renal function with urea-15.5mmol/l, creatinine-1139.9umol/l, and bicarbonate-11.7mmol/l. He also a known hypertensive and diabetic for more than 20 years on telmisartan, amlodipine, vasoprin and metformin. Renal scan showed a left kidneys in an anatomic position with a right ectopic kidney and bilateral grade 1 renal parenchymal disease. Urinalysis revealed 2+ protein with microscopic hematuria.

An assessment of ESRD secondary to diabetic nephropathy was made and he was counseled for urgent hemodialysis. Tabs metformin was discontinued. He was commenced on tabs torsemide, omeprazole, fesoate, medietriol, sodium bicarbonate, calcimax and doxazocin. We sustained telmisartan, amlodipine and vasoprin. After 1st session of hemodialysis a repeat EUCr showed improved renal function with urea-14.07mmol/l, creatinine-960umol/l, bicarbonate-13.0mmol/l and pack cell volume was 19.6% despite intra-dialysis transfusion of 2 units of blood. He was subsequently commenced subcutaneous erythropoietin 4000iu thrice weekly with weekly intravenous iron sucrose. He was counseled on early KTP because his performance status was

favorable and echocardiography was satisfactory with grade 1 left ventricular diastolic dysfunction and preserved biventricular systolic function. He was subsequently reviewed by other KTP team members including the urologists, nephrologist, anesthetics, neurologist, mental health physicians, legal department and hospital ethical committee in preparation for KTP.

All preliminary KTP investigation results for both the donor and recipient as well as complete HLA typing and cross matching, DSA, viral screening including VDRL and CMV, prostate specific antigen, urologic scan etc were satisfactory. Vasoprin, doxazocin and labetolol were discontinued with dose of nifedipine reduced to 20mg daily. Computed tomography urogram (CTU) carried out on the donor revealed bilateral functional kidneys with single artery, vein and ureter. The surgeons reviewed and opted to harvest the left kidney due to longer vessels compared to the right kidney. He was commenced on tacrolimus, mycophenolate mofetil, methylprednisolone and scheduled for 2 sessions of hemodialysis a day prior to KTP. ATG was also commenced few hours before surgery.

KTP was done with a living related donor. Both the donor and recipient surgery commenced simultaneously in our modern sophisticated twin theatre. The graft was harvested when the recipient surgeon was done with the opening of the recipient bed, dissection of the iliac vessels and preparation of the perfusion table. The implantation into the recipient commenced after the graft was perfused with specifically packaged "kidney perfusion solution". The renal artery was anastomosed first followed by the renal vein after which the kidney was perfused by releasing the bulldog and satinsky clamps as shown in Figures 1 and 2.

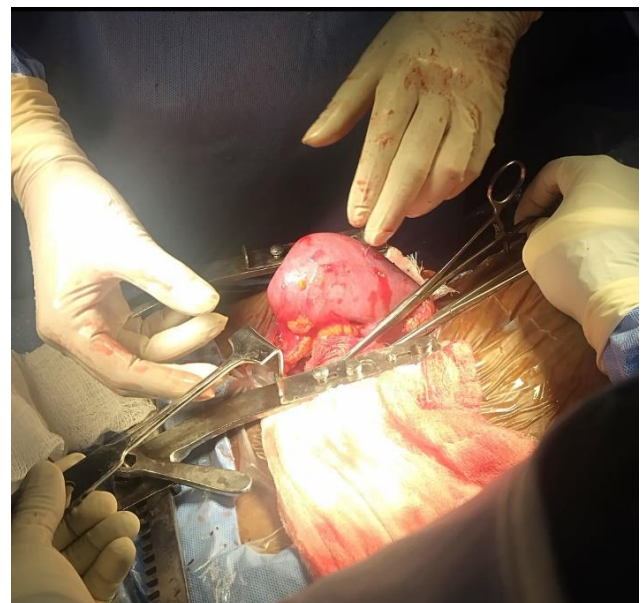


Figure 1. A well perfused graft.



Figure 2. Showing the ureter with urine jetting out as illustrated by the black arrows.

Ureteric implantation was by extra-vesical technique as described by Lich and Gregoir. Redivac drain was inserted, the wound closed in layer and dressing applied with the overall operation time for both donor and recipient falling under 140mins. Immediate post operation condition was satisfactory with vitals showing a pulse rate-70bpm, RR-19cpm, spo₂: 100%, BP-164/71mmhg, urine output: 550mls per hour. He was commenced on IV normal saline 500mls 8 hourly, IV meropenem 1g 12 hourly, IV levofloxacin 500mg daily, IV omeprazole 40mg daily, IV methylprednisolone 500mg in 100mls of normal saline over 30mins, IV chlorpheniramine 10mg after methylprednisolone, IV paracetamol 900mg after chlorpheniramine, IV antithymocyte globulin 75mg in 200mls of normal saline over 6 hours after paracetamol. IV paracetamol 600mg 8hourly, IV pentazocine 30mg 8 hourly. Tabs septrin 480mg daily, isoniazid 300mg daily, pyridoxine 25mg daily and syrup oral nystatin drop 100,000iu 6 hourly. Tabs valgancyclovir 450mg and sc clexane 40mg daily was commenced after 72 hours. Renal Doppler ultrasound scan showed a well perfused graft. Serial twice daily EUCR was impressive and normalized after 48 hours with adequate post-transplant hourly urine output. 24 hour urine input/output was 7318/4555mls, 5430/4485mls, 12649/9530mls, 8471/7612mls, 5538/4582mls, 7190/7230mls, 4851/5395mls, 1500/1200mls on day 1 to 8 respectively. Serial serum tacrolimus assay was within normal limit.

He was Discharged on tabs cefuroxime 500mg bd, levofloxacin 500mg od, tacrolimus 3.5mg bd, MMF 1g bd, septrin 480mg od, isoniazid 300mg od, pyridoxine 25mg od, valgancyclovir 450mg od, solifenacin 5mg od, astyfer 1 dly, oral nystatin drop 100,000iu qds, omeprazole 20mg bd, linagliptin 5mg od, nifedipine 20mg dly if SBP >180mmhg, duodart 0.5/0.4mg od, subcutaneous soluble insulin 10iu tds,

sc lantus insulin 12iu nocte.

He was seen weekly at the outpatient department for follow up where we observed a very poor drug compliance as he skips some of his medications and most of his children were busy and rarely available to give special support. We re-admitted him for optimal nursing attention until we are satisfied on the quality of home care support. We counseled the family to seek the services of a domiciliary care medical personnel that will live with him and pay special attention to his drugs and other emerging concerns. Double j stent was retrieved on post-operative day 26. Subsequent clinic follow up was uneventful and satisfactory with noticeable exponential progress in general condition.

3. Discussion

Kidney transplantation (KTP) is the most viable and cost effective form of renal replacement therapy (RRT) and a well-recognized definitive alternative for selected elderly patients with end-stage renal disease (ESRD). [1] The recipient of the graft achieves significant reduction in the morbidity and over 10 year favorable outcome. [1, 2] Other options of RRT may appear cheaper but cumulative economic burden surpasses KTP with notably systemic untoward effects including simple renal cysts formation especially with long-term dialysis. [1] We encourage our elderly patients with ESRD and favorable performance status to opt for KTP as early as possible similar to this index case. Obiatuegwu K et al observed a success rate of 82.7% which was attributed to early KTP, strict adherence to transplant protocol, excellent donor HLA/DSA typing and compatibility, use of branded immunosuppressive drugs as well as ‘top notch’ experienced surgical and medical team of experts. Similar principle and protocol was applied in the index case which probably contributed to the success of the process with normalization of renal function within 2 days.

Wang Y et al noted that graft survival as well as discontinuance of hemodialysis are the most important indices in assessing outcome of KTP. [11] The index patient stopped dialysis after KTP with progressive normalization of renal function within 48 hours. The normalization of renal function within 48 hours in this index advanced elderly patient was impressive and shows that the graft is thriving and likely to be sustained. Keith DS et al observed that for selected group of elderly with ESRD, KTP remains a viable alternative for better quality of life. This is also in keeping with our observation in our evidenced by discontinuation of hemodialysis, normal renal function within 48 hours as well as improved QoL. Aging is often associated with functional decline in the immune system referred to as ‘immunosenescence’. [12] This decline in immune function has major implication on immunosuppression in this group of kidney transplant recipients and will invariably impact adjunctively on the conventional drug-induced immunosuppressive protocol observed in KTP. Immunosenescence, drug-induced immunosuppression and

living related donor graft likely contributed to the immediate and impressive success of KTP in this index patient despite the advanced age and initial fears prior surgery.

Being elderly should not be an absolute contraindication to KTP. Snanoudj R et al reported that although early mortality may occur, the benefit of survival of elderly patients after KTP reasonably outweighs those maintained on the waiting list or hemodialysis. The rising trend of KTP amongst the elderly in United States was accounted for 13.3% of all kidney transplant recipients. [6] This is significant and further affirms this need to consider KTP in stable elderly patients who are senior citizens and needs advanced care and support. Our patient was offered prompt support and care. He was counseled on early KTP and was able to get a living related donor. On our part as caregivers we ensured prompt review and detailed assessment to rule out factors that may negatively affect the process before proceeding to surgery. Etiology, patient selection and presence of co-morbidities as well as detailed geriatric evaluation can help exclude elderly patients with clinical symptoms of frailty. [13, 14] The decision to transplant an elderly patient must also consider the characteristics of the donors as the use of donors with increasingly expanding criteria may impact negatively on the survival of both the graft and/or the patient. Our patient had a very good performance status and opted for early KTP using a living related donor. He was also not on long-term hemodialysis as he had only few sessions prior to surgery. This invariably supports the observation of Heldal K et al and also contributed to the impressive outcome of the entire process. [15].

Lemoine M et al observed that living donor remains ideal for elderly recipients with the alternative being the extended criteria donor to reduce the waiting time in this group of weak and delicate individual. They also noted that the choice and brand of immunosuppressive protocol which is also important due to the high risk of infectious and cardiovascular events triggering various forms of rejection with accompanying severe consequences. [7] Our index patient received a living related donor graft with branded medications which was promptly and religiously administered by our team. This invariably contributed to the exponential good progress experienced and further supports the observation of Lemoine M et al.

Despite a safe and good graft survival, the mortality rate in elderly recipients remains significant. Adani GL et al observed that infections (42%) was the leading cause of mortality after KTP in this group of patients followed by malignancy (23%). [8] This infectious complications may be further worsened by the immunosuppressive protocol induced in patients coming for KTP. To avert this complication we commenced the index case on intravenous broad spectrum carbapenem antibiotics (meropenem) which is active against both gram negative and gram positive bacteria and nursed the patient in our intensive care unit where sterility is top notch. We also ensured that all caregivers observed safety sterile protocol before gaining access to the intensive care unit.

Another critical challenge peculiar to the elderly remains the unintentional poor compliances to post KTP medications probably due to dementia or poor cognition associated with aging. [9] This was typically observed in our index patient and to avert the serious complications this may pose on graft survival, we re-admitted the patient for optimal care as per medications and other emerging concerns. We also agreed on certain conditions that must be convincingly met before he is discharged again including the engagement of a domiciliary care medical personnel who will be trained by our transplant team on post op care and medications. The care giver is also expected to live with the patient in the same house for at least initial 3 months to ensure the patient and family members has properly mastered the protocol. High drug burden and number of pills also contribute to this poor compliance. We believe that this can also be tackled with the engagement and training of the domiciliary medical care giver who will religiously administer all medications without default.

Kidney transplantation outcomes in elderly remains controversial with less than a year re-hospitalization of 39.5% with high infectious complications of 18.4% and overall mortality rate of 23.1%. Our patient was re-admitted within a month but not due to infection. We re-admitted the patient in order not to risk any insult on the graft from poor drug compliance. Several authors had reported positive correlation between high mortality rate and factors related to surgery such as cold ischemia time, increasing donor age as well as factors related to the recipients such as pre-transplantation duration of dialysis, cardiovascular disease, delayed graft function, early cardiovascular complications after KTP and early re-hospitalizations. [10, 17] We were mindful of the cold ischemic time in this index case hence the graft was harvest when the recipient bed and perfusion tray/apparatus were set. More so, the surgeons were experienced and skillful with time management. This reduced the cold ischemic time and probably impacted significantly on the success. Other factors that probably influenced the success were young donor age (34), early KTP which precluded the need for long-term hemodialysis and relatively stable cardiac condition with good ejection fraction. This is in keeping with the report of Silva RM et al and further emphasizes on the need for a more rigorous pre-transplant evaluation focusing on comorbid conditions with strict exclusion criteria for both donor and recipient. Others that enhanced our success are younger living related donor, excellent complete and inclusive HLA typing and cross matching, 'top notch' experienced surgical and medical team as well as strict adherence to transplant protocols. Kurschat C et al observed that compared to deceased donor, KTP using a living donor kidney will most likely function spontaneously and with long term graft survival and worthwhile in these group of weak and delicate elderly recipients. [1, 16]. We performed the index KTP with living related donor graft and observed spontaneous function with urine jetting out from the ureter following perfusion of the graft after vascular anastomosis as shown in Figures 1 and 2. This is in keeping with

findings by Kurschat C et al that reported the same spontaneous response with living related donors.

4. Conclusion

We were mindful of the advanced age of the index recipient prior to surgery but was encouraged by the outcome of the detailed evaluation by the transplant team, early KTP, young living related donor, stable cardiac condition, satisfactory blood sugar control, cooperation of family members and availability of 'topnotch' team of expert. Despite our initial fears prior to KTP as per advanced age as well as drug compliance we were able to navigate same concerns and other emerging challenges with regularly follow up as well as engaging a domiciliary care giver while we envisage long term graft survival.

Abbreviations

KTP	Kidney Transplantation
EUCR	Electrolyte, Urea and Creatinine
RRT	Renal Replacement Therapy
ESRD	End Stage Renal Disease
DM	Diabetes Mellitus
HLA	Human Leucocyte Antigen
DSA	Donor Specific Antibodies
CTU	Computed Tomography Urogram
QoL	Quality of Life
VDRL	Venereal Disease Research Laboratory
CMV	Cytomegalovirus
IV	Intravenous
MMF	Mycophenolate Mofetil

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Conflicts of Interest

The authors declare no conflicts of interest.

References

- [1] Obiatuegwu Kenenna, Otabor Christopher, Agrawal Rajesh Kumar, Magnis Felix, Aremu Abayomi, Aniede Ernest, Olawoye Olatunde, Odinenu Theodora, Chikodili Ugochukwu. Kidney Transplantation: Our Experience in a Private Tertiary Center in Abuja. *Science Journal of Clinical Medicine* 2025; 14(2): 12-19. <https://doi.org/10.11648/j.sjcm.20251402.11>
- [2] Huang E, Segev DL, Rabb H. Kidney transplantation in the elderly. *Semin Nephrol*. 2009 Nov; 29(6): 621-35. <https://doi.org/10.1016/j.semnephrol.2009.07.011>
- [3] Hajime Orimo, Hideki Ito, Takao Suzuki, Atsushi Araki, Takayuki Hosoi, Motoji Sawabe. Reviewing the definition of "elderly". *Geriatrics and Gerontology International*. 2006; 6(3): <https://doi.org/10.1111/j.1447-0594.2006.00341.x>
- [4] Eda Ünal, Aysel Özdemir. Old Age and Aging. October 2019. In book: *Recent Studies in Health Sciences*. Publisher: St. Kliment Ohridski University Press Sofia.
- [5] Wolfe RA, Ashby VB, Milford EL, Ojo AO, Ettenger RE, Agodoa LY, et al. Comparison of mortality in all patients on dialysis, patients on dialysis awaiting transplantation, and recipients of a first cadaveric transplant. *N Engl J Med*. 1999; 341: 1725-30. <https://doi.org/10.1056/NEJM199912023412303>
- [6] US Renal Data System. *USRDS 2008 annual data report: atlas of end-stage renal disease in the United States*. Bethesda, MD: National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases; 2008.
- [7] Lemoine M, Guerrot D, Bertrand D. Transplantation rénale et sujet âgé mise au point [Focusing on kidney transplantation in the elderly]. *Nephrol Ther*. 2018 Apr; 14(2): 71-80. French. <https://doi.org/10.1016/j.nephro.2017.06.003> Epub 2017 Nov 22.
- [8] Adani GL, Baccarani U, Crestale S, Pravisani R, Isola M, Tulissi P, Vallone C, Nappi R, Risaliti A. Kidney Transplantation in Elderly Recipients: A Single-Center Experience. *Transplant Proc*. 2019 Jan-Feb; 51(1): 132-135. <https://doi.org/10.1016/j.transproceed.2018.04.081> Epub 2018 Jun 30.
- [9] Ponticelli C, Podestà MA, Graziani G. Renal transplantation in elderly patients. How to select the candidates to the waiting list? *Transplant Rev (Orlando)*. 2014 Oct; 28(4): 188-92. <https://doi.org/10.1016/j.ttre.2014.07.001> Epub 2014 Jul 31.
- [10] Silva RM, Leal R, Marques MG, Rodrigues L, Santos L, Romãozinho C, Alves R, Figueiredo A. Factors Influencing Short-Term Patient Survival in Elderly Kidney Transplant Recipients. *Transplant Proc*. 2023 Jul-Aug; 55(6): 1400-1403. <https://doi.org/10.1016/j.transproceed.2023.05.006> Epub 2023 Jun 7.
- [11] Wang Y, Snoep JD, Hemmelder MH, van der Bogt KEA, Bos WJW, van der Boog PJM, Dekker FW, de Vries APJ, Meuleman Y. Outcomes after Kidney Transplantation, Let's Focus on the Patients' Perspectives. *Clin Kidney J*. 2021 Jan 20; 14(6): 1504-1513. <https://doi.org/10.1093/ckj/sfab008>
- [12] Keith DS. Transplantation in the elderly patient. *Clin Geriatr Med*. 2013 Aug; 29(3): 707-19. <https://doi.org/10.1016/j.cger.2013.05.010>
- [13] Snanoudj R. Transplantation rénale du sujet âgé un bénéfice pour tous? [Kidney transplantation in the elderly: A benefit for all patients?]. *Nephrol Ther*. 2021 Apr; 17S: S115-S118. French. <https://doi.org/10.1016/j.nephro.2020.02.007>
- [14] Randall HB, Cao S, deVera ME. Transplantation in elderly patients. *Arch Surg*. 2003 Oct; 138(10): 1089-92. <https://doi.org/10.1001/archsurg.138.10.1089>

- [15] Heldal K, Leivestad T, Hartmann A, Svendsen MV, Lien BH, Midtvedt K. Kidney transplantation in the elderly--the Norwegian experience. *Nephrol Dial Transplant*. 2008 Mar; 23(3): 1026-31. <https://doi.org/10.1093/ndt/gfm719> Epub 2007 Dec 13.
- [16] Kurschat C. Nierentransplantation im Alter [Kidney transplantation in old age]. *Z Gerontol Geriatr*. 2016 Aug; 49(6): 488-93. German. <https://doi.org/10.1007/s00391-016-1118-x> Epub 2016 Jul 27.
- [17] Ko EJ, Yang J, Ahn C, Kim MS, Han DJ, Kim SJ, Yang CW, Chung BH; Korean Organ Transplantation Registry Study Group. Clinical outcomes of kidney transplantation in older end-stage renal disease patients: A nationwide cohort study. *Geriatr Gerontol Int*. 2019 May; 19(5): 392-398. <https://doi.org/10.1111/ggi.13630> Epub 2019 Feb 20.
- [18] Živčić-Ćosić S, Süsal C, Döhler B, Katalinić N, Markić D, Orlić L, Rački S, Španjol J, Trobonjača Z. Kidney Transplants from Elderly Donors: The Experience of a Reference Center in Croatia. *Exp Clin Transplant*. 2022 Jan; 20(1): 19-27. <https://doi.org/10.6002/ect.2021.0366>