

# Analysis of the relationship between postoperative ophthalmic complications and dialysis time of pre-kidney transplantation

Yao-Lei Wang, Fan Qi, Jin-Liang Xie, Lin Qi, Cheng Zhou, Xiang-Rong Zhu, Xiang Ding, Bo Yang, Peng Jin

Xiangya Hospital, Central South University, Xiangya Road No.87, Changsha 410008, Hunan Province, China

**Correspondence to:** Yao-Lei Wang. Xiangya Hospital, Central South University, Xiangya Road No.87, Changsha 410008, Hunan Province, China. wangyaolei2012@126.com

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## Abstract

• **AIM:** To determine the influence of the dialysis time before kidney transplantation on postoperative ophthalmic complications.

• **METHODS:** One hundred and eighty three patients who were given the follow-up after kidney transplantation were selected, including 124 males and 59 females. The dialysis time before kidney transplantation was  $(2.9 \pm 2.1)$  years. Among them, there were 93 cases having cadaveric renal transplantation and 90 cases having living relative renal transplantation. The conditions of ophthalmic complications in all the patients after kidney transplantation were investigated and the incidence rate on ophthalmic complications having different dialysis time before kidney transplantation was given Chi-square test and Chi-square linear trend test.

• **RESULTS:** Among 183 patients with kidney transplantation, 95 patients (51.9%) had at least one ophthalmic complication and the rest 88 patients (48.1%) had no significant abnormality at the eye region. The most common ophthalmic complications were pinguecula/conjunctival degeneration (31 cases), the following was caligo lentis (24 cases). The main manifestations were grayish white granule and plaque turbidity occurred in posterior capsule at the posterior pole of crystalline lens. The angulus iridocornealis of 5 patients (5.3%) with cataract and glaucoma were all open-angle through the detection by gonioscope. Through visual field examination, there were 2 patients with paracentral scotoma, 2 patients with arcuate scotoma and one case with nasal step.

• **CONCLUSION:** The experiments verify that the incidence of glaucoma was related to the dialysis time before kidney transplantation, and the incidence rate might be higher if the dialysis time is longer.

• **KEYWORDS:** kidney transplantation; hemodialysis; dialysis time; ophthalmic complications

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## INTRODUCTION

With the development of the surgical technique and the application of neotype anti-rejection drugs, the survival rate of the patients with kidney transplantation is improved continuously [1]. However, due to the primary diseases causing kidney failure, the long-term calculation of the toxic substance in the body and the long-term use of hormones and immunosuppressants, some complications occur after the transplantation. Most renal functions of the patients after kidney transplantation would obviously improve, but the systemic application of the immunosuppressants (especially the glucocorticoids) is necessary. Both of them will lead to the incidence of ophthalmic complications [2].

The main manifestations of ophthalmic complications after kidney transplantation were cataract, glaucoma and some retinal vascular diseases, *etc.*, which will lead to the progressive damage of visual function and even short-term visual loss [3,4]. Some researches found that long dialysis time of pre-kidney transplantation caused lesions in ocular surface and increased the possibility of conjunctival degeneration and sediment under conjunctiva [5,6]. At the same time, the conditions of the patients limited disease detection and treatment, which made the treatment relatively tough with poor efficacy. Dialysis treatment before kidney transplantation for chronic renal failure (CRF) patients is necessary for the survival of patients. However, the studies found that long-term dialysis before kidney transplantation increased the incidence rate of some ocular diseases [7]. A systemic retrospective analysis on ophthalmic complications

of 183 patients and discussed the relationship between ophthalmic complications and the dialysis time before kidney transplantation was described in this study.

## MATERIALS AND METHODS

**Subjects** The follow-up patients after kidney transplantation during May, 2005 to October, 2011 were selected. The selection standard:  $\geq 6$  months after kidney transplantation, serum creatinine level  $\leq 115 \mu\text{mol/L}$ . One hundred and eighty three patients were selected (124 males and 59 females). The age was 18-65 ( $39.7 \pm 9.5$ ) years. The time since kidney transplantation had been 0.6-12 ( $4.1 \pm 1.9$ ) years and the dialysis time before kidney transplantation was 0.5-7 ( $2.9 \pm 2.1$ ) years. All the patients were on haemodialysis before kidney transplantation. The procedures of eye examination were explained to the patient and verbal consent was taken.

**Methods** Kidney transplantation: Ninety-three patients had cadaveric renal transplantation and 90 patients living relative renal transplantation. All 183 patients were given methylprednisolone induced pulse therapy during the operation and early-stage after operation. Among them, 127 patients were given biological agent (antithymocyte globulin or monoclonal antibody CD-3) induced treatment. Immunosuppression plan after kidney transplantation: 116 patients were given ciclosporine combined with mycophenolate mofetil and prednisone. Sixty-seven patients were given tacrolimus combined with mycophenolate mofetil and prednisone; the drug dosage was adjusted according to the drug trough concentration.

The routine hormone usage: Eighty-seven patients were given 30mg/d prednisone after the induction for 6 months continuously. In the following 12 months, the dosage was reduced to 10mg/d. The reducing usage of hormone in the early stage after the transplantation: 25-30mg/d prednisone was given to the 87 patients after the induction. The maintenance dosage after 3 months was 10mg/d and that after 6 months was 5mg/d.

The detection method of ophthalmic complications: the international standard vision chart was adopted to examine the eyesight (including the best-corrected vision). The slit-lamp microscope was used to examine the anterior segment, fundus (with +90D lens) and intraocular pressure (IOP) (with Goldmann applanation tonometer). The gonioscopy and visual field examination were done in patients with high IOP or suspected glaucoma.

**Statistical Analysis** The SPSS13.0 software was used to conduct the statistical processing. Chi-square test and Chi-square linear trend test were used to detect the enumeration data.  $P$  value of  $< 0.05$  was taken as statistically significant.

## RESULTS

**Types of ophthalmic complications** Among the 183

**Table 1 Types and constituent ratio of ophthalmic complications in 183 patients after kidney transplantation**

Ocular findings	n	%
Ocular surface virus keratoconjunctivitis dysfunction	7	7.4
Pinguecula and conjunctival degeneration	31	32.6
Cataract	24	25.3
Glaucoma	5	5.3
Ocular fundus central serous chorioretinopathy dysfunction	5	5.3
Exudative detachment of retina	4	4.2
Central/branch retinal vein occlusion	3	3.1
Hypertensive retinopathy	8	8.4
Non-proliferative/proliferative diabetic retinopathy	7	7.4
Acute retinal necrosis	1	1.0
Total	95	100

patients with kidney transplantation, 95 patients (51.9%) had at least one ophthalmic complication and the rest 88 patients (48.1%) had no abnormality at the eye. The most common ophthalmic lesions were pinguecula/conjunctival degeneration (31 cases, 32.6%), followed by cataract (24 cases, 25.3%). The main manifestations were grayish white granule and plaque turbidity occurred in posterior capsule at the posterior pole of crystalline lens. Besides, the vacuole and water gap were seen. The angle of anterior chamber of 5 patients (5.3%) with glaucoma were all open-angle through the detection by gonioscope. Paracentral scotoma was noted in 2 patients, arcuate scotoma in 2 patients and nasal step in 1 case among the glaucoma patients (Table 1).

**Influence of dialysis time before kidney transplantation on postoperative ophthalmic complications** Chi-square test was used to detect whether dialysis time before kidney transplantation had influence on ophthalmic complications after transplantation (Table 2).

The incidence of glaucoma was significantly related to dialysis time before transplantation (Chi-square test  $P=0.024$ , Chi-square linear trend test  $P=0.026$ ). As a result, we can find that the incidence of glaucoma was related to dialysis time before kidney transplantation. The longer dialysis time is, the higher the incidence rate would be.

## DISCUSSION

The long-term hemodialysis, uncontrolled hypertension and the long-term application of massive dose glucocorticoid before transplantation were the risk factors causing ophthalmic complications after transplantation. Ophthalmic complications after transplantation were mainly related to age, primary diseases causing CRF, long-term calculation of toxic substance in the body and the long-term application immunodepressant.

Hemodialysis was mainly used to rectify the disorder of Water-electrolyte balance of patients with kidney failure, exclude excessive small molecule hazardous substances and decrease plasma osmotic pressure at the same time [8]. The changes of plasma osmotic pressure can influence the rate

**Table 2 Relationship between dialysis time before kidney transplantation and ophthalmic complications after transplantation**

Preoperative dialysis time(a)	Ocular findings (n)							
	Ocular surface dysfunction		Cataract		Glaucoma		Ocular fundus dysfunction	
	Yes	No	Yes	No	Yes	No	Yes	No
<1	19	59	14	68	0	76	14	65
1-3	12	51	7	57	0	63	11	58
4-5	4	19	2	19	2	22	2	17
>5	3	16	1	15	3	17	1	15
Total	38	145	24	159	5	178	28	155

of aqueous fluid production and high plasma osmotic pressure will decrease aqueous fluid production. The plasma osmotic pressure decreases after hemodialysis and aqueous fluid production increase. At the same time, urea nitrogen in crystalline lens during dialysis cannot rapidly decrease with the decrease of urea nitrogen in blood. Thus, osmotic pressure in crystalline lens and aqueous fluid lose the balance, the crystalline lens expand by absorbing the moisture, iris diaphragm of crystalline lens moves forward and the anterior chamber angle narrows, which influence the aqueous fluid draining and make IOP increase. The changes of urea nitrogen in vitreous cavity can also influence the IOP by the similar way [9,10]. Besides, it is reported that hemodialysis can lead to the spontaneous hemorrhage of perichoroidal space and then cause the rapid increase of IOP [11]. Because the CRF patients need the long-term hemodialysis, IOP may increase after each dialysis once anatomical features such as shallow of anterior chamber and narrow chamber angle exists. Dujic *et al* [10] reported that dialysis can cause acute glaucoma. Even there was no abnormal anatomy, the long-term pathological IOP fluctuation may lead to the damage of chamber angle structure and optic nerve, which was consistent with what Xu *et al* [11]. This experiment found that dialysis time before transplantation significantly influence ophthalmic complications after transplantation, and the longer the dialysis time before transplantation is, the higher incidence rate of glaucoma.

Through clinical data analysis, the glaucoma of patients after kidney transplantation was open angle glaucoma, which was similar to the results of Kian -Ersi *et al* [5]. The dialysis time of 5 patients with glaucoma was over 5 years, which indicated that the influence of dialysis time before kidney transplantation on the incidence rate of ophthalmic complications after kidney transplantation will enhance as time passes. Although the receptors with good recovery after kidney transplantation felt the conditions improved and ocular damage caused by dialysis did not develop anymore, most organic changes were inconvertible, which was

obviously demonstrated on the long-term surviving patients after kidney transplantation. The average dialysis time of patients with kidney failure abroad is higher than that in domestic, which may be one of the reasons for the incidence rate of ophthalmic complications after kidney transplantation is lower than that in foreign reports [12,13].

Literatures also indicated that the long-term dialysis before kidney transplantation caused the other ophthalmopathy, for example, the increase of conjunctival degeneration after kidney transplantation and the incidence rate of deposition under conjunctiva [5-7]. Conjunctival degeneration is usually caused by the long-term radiation of ultraviolet ray, but the incidence of conjunctival degeneration in patients with kidney failure is mainly related to the long-term accumulation and stimulation by the toxic substance in body [14]. Hemodialysis can filter the toxic substance in patients with kidney failure, but this kind of substance will continuously accumulate during the dialysis interval. Therefore, the longer the hemodialysis time before kidney transplantation is, the longer the toxic substance accumulation time will be, which will lead to the high incidence rate of this kind of disease. Due to the different objects and dialysis time with foreign countries, we did not found that the dialysis time was related to the incidence rate of conjunctival degeneration after kidney transplantation in this study.

Through the experimental results and literature analysis, the types of ophthalmic complications and the incidence rate of some diseases had certain changes and the incidence rate of caligo lentis and glaucomawas lower than the literature reported. The reason may be as follows: after the drug combination, the dosage of each drug decreased on the base of guarantee the immunosuppressive effect, which avoided the toxic effect by using a certain drug at massive dosage. It is generally regarded that the incidence of ophthalmic complications after kidney transplantation is closely related to the long-term use of glucocorticoids at massive dosage [15]. Research verified [16] that the incidence of caligo lentis showed a dosage-dependent relationship of hormonal therapy and its incidence rate and incidence time are related

to the individual difference of androgen-sensitivity. The incidence rate ranges from 25% -50% . The long-term hemodialysis before transplantation and the application of hormone at massive dosage after transplantation may have influence on the increase of IOP and optic nerve damage. Glucocorticoid can also induce or intensify central serous chorioretinopathy and make it have a high incidence rate in the patients after kidney transplantation [17,18]. Besides, opportunistic infection that happens following the immunosuppressive therapy after kidney transplantation should not be neglected, for example, acute retinal necrosis syndrome caused by cytomegalovirus infection should also not be neglected because it can lead to the inconvertibly severe visual impairment [19,20].

Currently, the quick decrement method was applied in the hormone dosage, namely, the prednisone dosage was reduced to 5mg/d in about 6 months, which is lower than the maintain dosage (20-30mg/d) in other centers at home and abroad and its influence on aqueous was reduced[21]. The incidence rate of caligo lentis and glaucoma for the objects in this experiment was lower and the incidence rate of acute rejection did not increase. In a word, the dialysis time before kidney transplantation can significantly influence the incidence rate of some ocular diseases after transplantation. Therefore, kidney transplantation can be taken into consideration for the CRF patients at the end-stage.

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