

Cataract in Kidney Transplant Recipients^{*)}

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ABSTRACT

The relationship between the administrated dose of steroid and the grade of cataract was studied in 22 kidney transplant recipients maintaining a good graft function for more than one year. Posterior subcapsular cataract was observed in 19 patients, of whom seven showed severe cataract accompanied by visual disturbance. The total dose of steroid, particularly the dose in the period from three months after grafting, correlated with the grade of cataract. Among the 15 patients who had taken less than one year to reduce the dose of steroid (Medrol) to less than 15 mg/day, only two patients (13.3%) developed severe cataract with visual disturbance. On the contrary, among the seven patients who had taken more than one year to reduce the dose of Medrol, five patients (71.4%) developed severe cataract. These results suggest that the dose of steroid (Medrol) should be reduced to less than 15 mg/day within one year after transplantation in order to prevent the development of post-transplant steroid cataract.

INTRODUCTION

Cataract is one of the frequent complications of kidney transplant recipients. In 1960, Black⁹⁾ and co-workers reported that opacities lying under the capsule of the posterior pole of the lens were frequently observed in rheumatoid arthritis patients treated with steroid for an extended period. Thereafter, several authors^{7, 8, 11)} reported the same phenomenon. It is now well known that this type of cataract is a side effect of extended steroid therapy. Almost of all cataracts observed in kidney transplant recipients are attributed to steroid administrated as immunosuppressive drug.

In this study, the relationship between the dose of steroid and the grade of cataract was examined in 22 kidney transplant recipients showing a good graft function for more than one year.

PATIENTS AND METHODS

Twenty-two kidney transplant recipients (av-

erage age 33, range 21 to 54 years, 15 male and 7 female) were studied for 13 months to 137 months (average: 47 months) after transplantation. All the patients had received methyl-prednisolone (Medrol) and azathioprine. The steroid regimen was as follows. Intravenous administration of 1000 mg (Solu-Medrol) was made for the first three days; oral administration was commenced from the third day after transplantation as 200 mg, reduced by 40 mg daily to 80 mg/day, reduced by 20 mg every 3 days to 40 mg/day, reduced to 20 mg/day for three months after transplantation, and further reduced to a maintenance dose of 12 mg/day~8 mg/day within 1 or one and half year after transplantation. During acute rejection 1000 mg of Solu-Medrol was administrated by intravenous infusion for two or three times. The azathioprine dose was 4 mg/kg the day before transplantation and 2 mg/kg per day as maintenance dose after transplantation.

After pupillary dilatation, the eyes were examined with slit lamp and by direct and indirect

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ophthalmoscopy.

Cataract were graded as 0 when there was no abnormal findings, 1 when the lens was transparent but with very small clouding not accompanied by visual disturbance, 2 when clumps of opaque material were clearly seen with mild visual disturbance, 3 when heavy opaque clumps were detected with severe visual disturbance (Table 1).

Table 1. Grade of cataract

Grade	findings of lens
0	no abnormal findings
1	very small clouding without visual disturbance
2	clear clumps of opaque material with mild visual disturbance
3	heavy opaque clumps with severe visual disturbance

RESULTS

Posterior subcapsular cataracts of grade 1 to 3 were observed in 19 of 22 kidney transplant recipients. Eight patients was classified as grade 1, 4 patients grade 2, and 7 patients grade 3. The total dose of Medrol given to

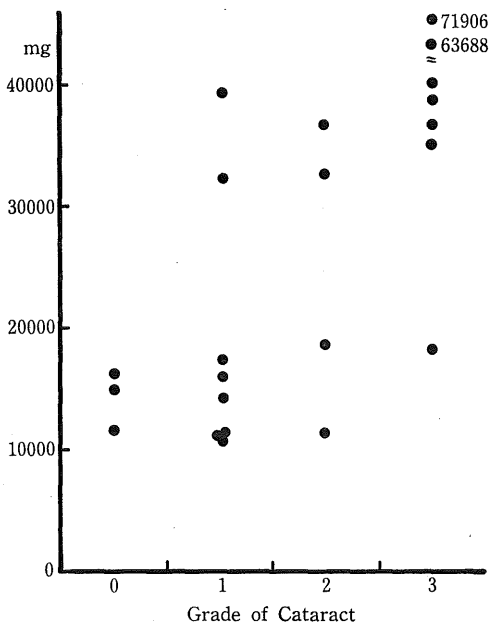


Fig. 1. Total dose of Medrol and the grade of cataract

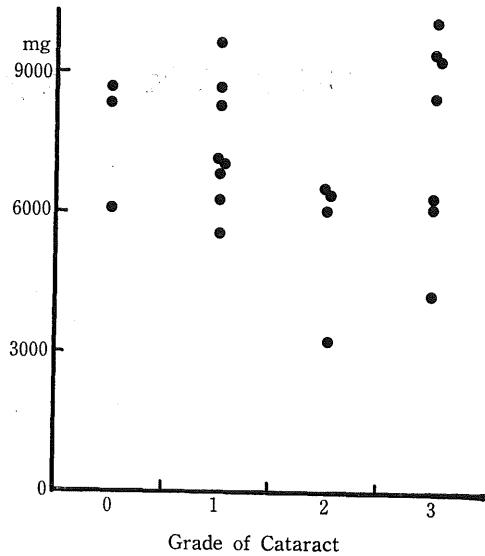


Fig. 2. Total dose of Medrol within three months after transplantation

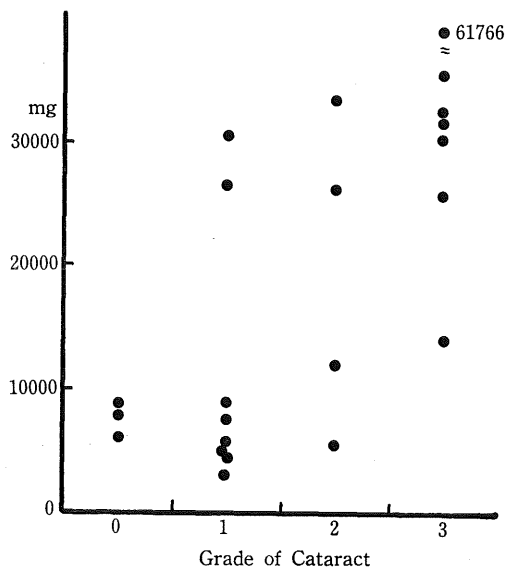


Fig. 3. Total dose of Medrol administered in the period from three months after transplantation

patients belonging to grade 3 was $43,452 \pm 16,938$ mg (mean \pm SD). This dose was significantly higher than the total dose of the patients belonging to grade 1 ($18,987 \pm 10,042$ mg) or grade 0 ($14,268 \pm 1,894$ mg) ($p < 0.05$) (Fig. 1).

The dose of steroid was high within three months after transplantation with a difference in dose by case. The total dose of Medrol

during this period was compared in patients belonging to grade 0 to 3. There was no significant difference in dose by the grade of cataract (Fig. 2).

Thus, the total dose of Medrol given in the period from three months after transplantation was compared in four groups. The total dose in patients belonging to grade 3 (32,991 ± 13,406 mg) was significantly greater than that in patients of grade 1 (11,354 ± 9,749 mg) and that in patients in grade 0 (6,536 ± 945 mg) ($p < 0.05$) (Fig. 3).

Although the total dose increases with increase in the period of steroid administration, there was no significant difference in this period in the four groups. It was therefore expected that the period in attaining the maintenance dose might have a strong influence on the grade of cataract. The grade of cataract was thus compared between the patients who had taken more than one year to reduce the Medrol dose to less than 15 mg/day and the patients who had taken less than one year to reduce such level of the Medrol. Among the 15 patients who had taken less than one year, only two patients (13.3%) belonged to grade 3 and 7 patients (46.7%) belonged to grade 1. On the contrary, among the 7 patients who had taken more than one year, 5 patients (71.4%) belonged to grade 3, and grade 1 was observed in only one patient. There was no patients without cataract in this group (Table 2).

Table 2. The period to reach the dose of Medrol of less than 15 mg/day and grade of cataract

Grade	Period	
	less than 1 yr. (n=15)	more than 1 yr. (n=7)
0	3(20%)	0(0%)
1	7(46.7%)	1(14.3%)
2	3(20.0%)	1(14.3%)
3	2(13.3%)	5(71.4%)

($\chi^2=52.993$, $p < 0.005$)

DISCUSSION

Cataract in kidney transplant recipients has been reported by many authors^{1,2,5,6,10,12-15}, who have observed that cataract is induced by

long term steroid therapy. Ono⁹) has described the mechanism involved as follows. Long term steroid administration brings disturbance of oxidative phosphorylation in the lens, and metabolic system of steroid is inhibited to prevent inactivation of steroid. Thus, steroid exists in the lens as an active type. This type of steroid has a catabolic activity and an inhibitive effect on the metabolism of lens protein and these opaque material is produced.

According to previous reports, there was variation in frequency of cataract in kidney transplant recipients ranged from 23¹²⁾ to 93%⁵⁾, although some authors^{18,15)} have reported that the total dose of steroid was not correlated with cataract, other authors^{5,6,10,12)} have observed that the greater the total dose of steroid the higher is the frequency of cataract. In our study, the total dose of Medrol was found to correlate with the grade of cataract. Particularly, the total dose administered in the period from three months after transplantation produced a strong effect on the grade of cataract, while no significant correlation was observed with the period of steroid administration. Therefore, the period to reach the maintenance dose was considered to be a major factor to produce the difference in total dose of steroid given in the period from three months after transplantation. Duke-Elder⁴⁾ has observed that daily administration of prednisolone at a dose of less than 10 mg did not bring rise any abnormality, but 75% of patients, whose daily dose exceeded 15 mg developed cataract. The same findings were reported by Oglesby⁹⁾. These reports suggest that 15 mg/day of prednisolone is the borderline daily dose for the development of cataract. In our series, high grade cataract more frequently observed in patients who had taken more than one year to reach the dose of Medrol of less than 15 mg/day, than in patients, who had taken less than one year to reach such level of Medrol. These results suggest that for the prevention of post-transplant steroid cataract the dose of steroid should be as low as possible and should be reduced to less than 15 mg/day within one year after transplantation.

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