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Original Article

The influence of ABO blood groups on sensitization of potential kidney transplant recipients

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Abstract: In this study 50 chronic renal failure patients were tested for blood ABO groups and for the presence of lymphocytotoxic antibodies against a panel of 20 donor lymphocytes (of known HLA types) using microcytotoxicity assay. The influence of other factors affecting sensitization, such as number of blood transfusions, pregnancies and previous graft rejections were analyzed too. The results showed that 41.2 % of blood group O patients, 61.1% of group A1, 90% of group B, and 80% of group A1B are sensitized (PRA > 10%).
These results pointed to higher incidence of sensitization in patients with blood groups B and A1B as compared to groups A1 and O .
Our data suggest an impact of the ABO system on the sensitization phenomenon.

Introduction

The increased population of sensitized uremic patients, i.e., patients having lymphocytotoxic antibodies waiting for kidney grafts is one of the critical problems in organ transplantation in terms of magnitude and impact [13].
Sensitization occurs after exposure to foreign HLA antigens associated with blood transfusion, pregnancies, or previous allograft rejections [12].
Young and Jordan 1992, suggested that chronic infections might have also a role in sensitization.
The role of ABO blood groups in kidney graft survival had been documented in a number of studies, [3] this role might be played at least partially through modulating the tendency for the development of lymphocytotoxic antibodies.
Indeed, Klouda and Bradley in 1985, suggested that the ABO system could play a role in the development of cytotoxic antibodies.
In the present study, we analyzed the possible influence of ABO blood groups upon the incidence and the degree of sensitization in fifty potential renal transplant recipient (chronic renal failure patients) in terms of lymphocytotoxic antibody production.

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Materials and methods

Patients: 50 chronic renal failure patients on chronic dialysis at Bab EL-Shaereya University Hospital and Nile International Kidney Center.
Lymphocyte donors: 20 potential kidney Donors attending Tissue Typing Laboratories at Ain-Shams University Specialized Hospital, National Institute of Nephrology and Urology and Cairo Medical Center.
Data obtained from patients files:

- Number of pregnancies, number of blood transfusions and number of graft rejections.
- Results of HBs Ag, HCV Ab, and HIV Ab.

Laboratory Techniques

Patients:

1. ABO blood groups (Forward / Reverse).
2. Panel reactivity determination (PRA %)using lymphocyte microcytotoxicity test as described by Khalil & Terasaki 1991. Lymphocyte donors: HLA typing (Class I and II) using lymphocyte microcytotoxicity test.

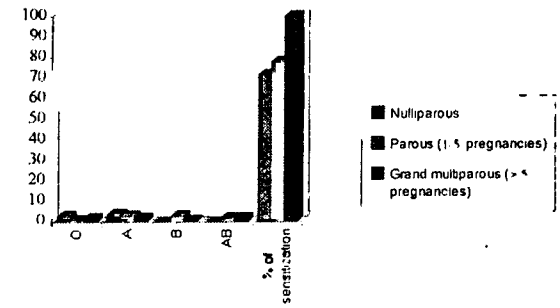
Resltus

Viral serology results

- 10% of cases were positive for Hbs Ag.
- 8.6 % of cases were positive for HCV Ab.
- None of our patients was positive for HIV Ab.

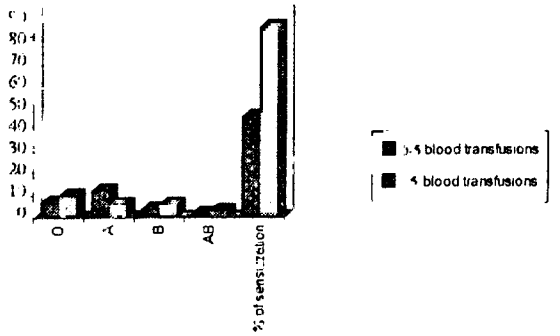
Distribution of female patients according to parity and blood groups (figure 1)

Fig. 1. Distribution of female patients according to parity and blood groups (with reference to the % of sensitized patients within each category)



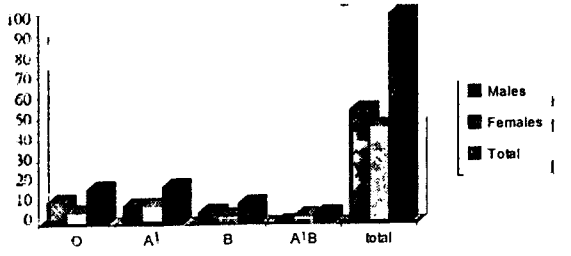
Distribution of patients according to number of blood transfusions and blood groups (figure 2)

Fig. 2. Distribution of patients according to number of blood transfusions and blood groups (with reference to the % of sensitized patients within each category).



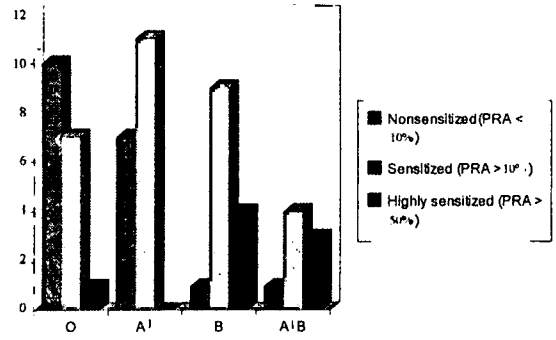
Distribution of patients according to different blood groups (figure 3)

Fig. 3. Distribution of patients according to different blood groups (With reference to their sexes)



Distribution of sensitization among different blood groups (figure 4)

Fig. 4. Distribution of sensitization among different blood groups (with reference to PRA %)



Discussion

The ABO system was discovered by Landstiener, and later was found to be determined by a group of glycoprotein antigens [9]. It had been considered as a barrier to be respected the same way the HLA barrier is respected in transplantation procedures.

It had been suggested that the ABO system could be included among factors that influence the tendency for development of lymphocytotoxic antibodies [7].

In the present work, the incidence of cytotoxic antibodies against a panel of 20 donor lymphocytes of known HLA types, was studied in 50 chronic renal failure patients (27 males and 23 females) and the impact of ABO groups on this phenomenon was analysed.

It was found that 62% (31) of the studied patients had PRA levels > 10%. A slightly lower incidence was found when we reviewed results obtained from other larger studies as those by Raffoux et al 1985, who found that 61% of 2800 dialysis patients at Saint Louis Hospital, Paris, France were sensitized and among them 542 patients (21%) were hyper-immunized with PRA > 75%.

Chronic infections were listed by Young and Jordan 1992, among the causes of sensitization, so we assumed that the higher prevalence of HCV infection among the studied patients - 96% in the present study compared to a range of 6% to 41.7 % prevalence reported by Manfro et al 1995 may also be partially responsible for this high incidence of sensitization.

The influence of parity status on sensitization has been demonstrated by Hendriks et al 1985, who reported that 24% of all highly sensitized patients on the Eurotransplant waiting list in June, 1985 were multiparous women confirming the importance of previous pregnancies as a risk factor for the development of broadly reactive cytotoxic antibodies, apparently due to immunization to the spouse's HLA-

haplotype inherited in the fetus during previous pregnancies [11].

In the present study 5 out of 7 nulliparous patients (71.4%) had PRA > 10% compared to 7 out of 7 (100%) grand multiparous patients.

The influence of blood transfusion had been stressed upon by Cicciarelli 1990, who pointed out that the development of PRA increases with challenge by blood transfusion, possibly due to active immunologic suppression, clonal deletion, clonal anergy, or exclusion of immunologic responders [15].

Transfusing HLA-matched blood, specifically from the prospective kidney donor, will decrease the incidence of sensitisation.

Unfortunately, all of our studied transfused patients had received transfusions from random donors, and this may explain the near double fold incidence of sensitization among patients who received more than five transfusions (84%), when compared to only 44% of those who received five blood transfusions or less.

Concerning the influence of failed previous allografts a significant increase in the prevalence of PRA in renal transplant recipients 28.57% before the first transplant to 70% after rejection of the first allograft was reported. In the present study, two of our patients each had previously rejected two renal allografts and a third patient rejected one graft, and all of the three patients consistently, had PRA > 50%, irrespective of ABO blood group, number of pregnancies or blood transfusion

In attempt to determine whether sensitization for kidney allograft is influenced by ABO blood groups of the recipient, Klouda and Bradley 1985, reviewed a total of 2412 patients, waiting for a kidney allograft, they found that among non-sensitized patients there was excess of group O over group A, a result suggesting that group A patients may be more likely to produce PRA than their group O counterparts, and that the ABO system could play a role in the development of cytotoxic antibodies.

In the present study 7 out of 17 blood group O patients (41.2%) had PRA > 10% as compared to 11 out of 18 blood group A patients (61.1%). We also found that 9 out of 10 (90%) blood group B patients had the highest sensitization rate among different blood groups, followed by blood group A1B where 4 out of 5 patients (80%) were sensitized

Although, in the present study blood group B patients had the highest incidence of sensitization, blood group A1B patients had the highest incidence of being highly sensitized with PRA> 50% where 3 out of 5 patients (60%) were highly sensitized followed by blood group B, where 4 out of 10 patients were highly sensitized, and lastly blood group O where 1 out of 17 patients (5.9%) had PRA > 50%. On the other hand, none of blood group A patients in the present study reached such a high PRA percentage.

The discrepancy between the incidence of sensitization and its degree among various blood groups may be attributed to the multiplicity of risk factors. Generally B and A1B groups attained the highest incidence and degree of sensitization as compared to groups O and A.

The higher incidence of sensitization found in the present study among blood group B patients might be at least partially responsible for the poor graft survival rates among blood group B patients and similarly the better graft survival rates among blood group O patients as reported by Hassan 1994. Again, the longest renal waiting times, for every racial groups (Whites, Blacks and others) studied by Ellison et al 1993, in blood group B patients may be accounted for by the higher incidence of sensitization among them.

So, we suggest that certain ABO blood groups are associated with lower tendency for sensitization and less broadly reactive antibodies (lower PRA %) as blood group O followed by group A, whereas blood groups B and A1B are associated with higher tendency for sensitization and with more broad panel reactivity (higher PRA %).

If such an association is confirmed by larger studies the chances of sensitization in a given prospective kidney transplant recipient could be predicted allowing better tailoring of immunosuppressive protocols.

Conclusion

We can conclude that ABO blood groups apparently have some kind of influence upon the sensitization phenomenon. The tendency for sensitization in general and being highly sensitized in particular is different among patients of different blood groups as evidenced by the highest incidence and degree of sensitization in blood groups B and A1B patients.

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