CASE REPORT

A case of nearly mistaken AB para-Bombay blood group donor transplanted to a group 'O' recipient

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SUMMARY

Unintentional ABO mismatch kidney transplantation can cause detrimental hyperacute rejection. We report the first successful ABO incompatible kidney transplantation from an AB para-Bombay donor to O recipient. At the initial evaluation, the donor's ABO type was discordance on the cell typing and serum typing, which typed to be 'O' as cell typing and 'AB' as serum typing. At the second investigation, it was confirmed that the donor had a unique, rare but not uncommon blood type AB para-Bombay which was incompatible with the recipient's blood group. The kidney transplantation was successfully performed by an ABO incompatible preconditioning, double filtration plasmapheresis (DFPP) and rituximab. The serum creatinine at 12 months post-transplantation was 1.3 mg/dL. The pathology of the kidney biopsy showed no signs of rejection.

BACKGROUND

ABO blood type mismatch/incompatibility will result in renal allograft hyperacute rejection. Therefore, it is extremely important to accurately type the blood group of the donor and recipient to avoid a preventable, detrimental outcome. An AB para-Bombay blood type is a rare but not uncommon blood type and can be unintentionally misclassified as blood type 'O'. If this mishap is not rectified, the kidney transplantation of 'AB' para-Bombay donor to 'O' recipient will result in immediate intravascular thrombosis and sudden allograft loss due to anti-A/anti-B of the recipient's serum and A-antigen/B-antigen of the donor's kidney. As a result of this, we report the very first successful case of AB para-Bombay donor to blood type O recipient by utilising the ABO incompatible protocol.[1]

CASE PRESENTATION

A 51-year-old woman with end-stage renal disease was evaluated for living related kidney transplantation. The donor was her biological sister, a healthy, 54-year-old woman with creatinine clearance of 119 mL/min/1.73 m^2.

The conventional routine tube test was used to type the blood of the recipient and donor. From this test, the recipient had H antigens on her red blood cells (RBC) and anti-A/anti-B in her serum. As a result of this, we concluded that the recipient had blood type O. As for the donor, we did not detect any A and B antigens on her RBC (table 1). This initial finding of cell typing can be misinterpreted as having blood type 'O'. However, for serum typing, we did not detect any anti-A and anti-B antibodies in the donor's serum, which resembled blood type AB. These discrepancies required additional investigations. When we re-evaluated the donor's results based on the H antigen system, H antigen was undetected on her RBC while anti-H was present in her serum. This result represents AB para-Bombay blood type. For the final confirmation, we evaluated the donor's saliva for A, B and H antigens because the ABO antigens on the RBC and other tissues (including the kidneys) are controlled by different enzymes, fucosyltransferase 1 (FUT1) and fucosyltransferase 2 (FUT2), respectively, so it is possible that the antigen results from the RBC may not yield the same results as those from the organs.[2] Hence, we performed the saliva test and were able to detect A, B and H antigens. This confirmed that she was a 'secretor', which indicated that her A and B antigens were also expressed on her kidney epithelial cells. After putting all of this information together, we were able to conclude that the donor's blood type was an AB para-Bombay. Kidney transplantation from this donor to non-AB blood type recipient is considered to be ABO incompatible.

TREATMENT

After discussion with the donor and recipient, the medical team conceded and agreed to carry out the ABO incompatible kidney transplantation. Additional pretransplantation investigations were carried out; the donor and recipient were both positive for antihepatitis B and negative for hepatitis B surface antigen, antihepatitis B core, antihepatitis C virus and anti-HIV; cytomegalovirus-IgG serology was D+/R+; and the human leucocyte antigen (HLA) typing did not yield any mismatch. From the panel reactive antibody, T cells and B cells were 71% and 44%, respectively. The Centers for Disease Control (CDC) and flow cytometry cross-matches were both negative. Luminex single antigen testing was positive for HLA antibody but negative for donor-specific antibody. The recipient's anti-A and anti-B IgG antibody titres were both 1:512.

Pretransplant desensitisation was initiated with 500 mg rituximab intravenously on day 14 followed by alternate days of double filtration plasmapheresis (DFPP) until day 3, when DFPP was increased to every day. Tacrolimus, mycophenolate mofetil 1500 mg/day and prednisolone 20 mg/day were also introduced on day 14. The trough level

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Table 1 Results of the blood tests for the donor compared to different blood types

Type	ABH antigens on red cells			ABH in secretions	Antibody in serum
	H	A	B		
O	H	–	–	H	Anti-A, anti-B
AB	H	A	B	A, B, H	–
O Bombay	–	–	–	–	Anti-H, anti-A, anti-B
AB para-Bombay	–	–/trace	–/trace	A, B, H	Anti-H
Donor blood type	–	–	–	A, B, H	Anti-H

for tacrolimus was maintained at 10 ng/dL. The patient's anti-A and anti-B antibody titres gradually decreased and reached 1:16 on the day of the transplantation. The inductions were 1000 mg of methylprednisolone for 3 days and 20 mg of basiliximab on days 0 and 4. The operation was performed successfully without any complications. The allograft was fully functional immediately after the transplantation and the serum creatinine dramatically decreased to 0.8 mg/dL in 7 days. The anti-A and anti-B titres gradually increased to 1:128 on day 7 with no effect on the function of the allograft. The patient was later discharged from the hospital with tacrolimus, mycophenolate mofetil, prednisolone, acyclovir, cotrimoxazole, amlodipine and omeprazole.

OUTCOME AND FOLLOW-UP

Anti-A and anti-B were both increased from 1:128 on day 7 to 1:256 at the end of the second month. Six months post-transplantation, the anti-A and anti-B titres were stable at 1:256. Our protocol of postoperative anti-A/anti-B management is surveillance without prophylaxis plasmapheresis as in the previous study.[1] The patient's serum creatinine levels were 1.1, 1.29 and 1.7 mg/dL at 1, 3 and 6 months, respectively. The 6 months protocol allograft biopsy revealed calcineurin inhibitor toxicity but there were no signs of allograft rejection even though the C4d staining was positive (G0 CG0 I0 CI3 T0 CT3 V0 CV2 AH0 MM0 ptc0 C4d1). When we lowered the tacrolimus level, the serum creatinine gradually declined to 1.3 mg/dL at 12 months post-transplantation.

DISCUSSION

In order to have a successful kidney transplantation, we highly recommend that ABO blood type be intensively evaluated because testing only for A-/B- antigen or antibody is not enough and can result in preventable mishaps. It is extremely important that blood type evaluation for transplantation include antigen as well as antibody detections, including H antigen and H antibody. Although kidney transplantation can be performed in ABO compatible as well as incompatible patients, for those who are ABO incompatible it is pertinent that the recipients are desensitised by removing the pre-existing anti-A or anti-B antibodies from the recipient's serum prior to kidney transplantation; otherwise, this will result in hyperacute rejection and immediate allograft failure.[1 3 4]

The para-Bombay blood type is rare but not uncommon in Mumbai it has a prevalence of 0.01% (1 in 10 000).[5] The A- and B- antigens are expressed on tissues but not on RBC, so if the patient is not tested specifically for this, we would not know if she/he has a para-Bombay blood type. This was seen in our case, because the A-/B- antigens and antibodies were both undetectable in our donor, which led us to misinterpret the results to be a common AB or O blood type. However, on further investigation using the patient's saliva, A, B and H antigens were found. Since our patient is a 'secretor', we were able to deduce that she had an AB para-Bombay blood type. This piece of information is essential because the kidney epithelials can express AB antigen and can result in rejection of the allograft due to the incompatibility of the ABO type. This problem can easily be prevented by preconditioning the recipient prior to the transplantation.

To the best of our knowledge, our patient is the first recipient to have successful kidney transplantation across AB para-Bombay blood type without any complications. The allograft function was excellent and there were no signs of rejection. During the post-transplantation period, the anti-A and anti-B antibody titres increased to 1:256. Our post-transplant management protocol for rebounding of the anti-A/anti-B is surveillance, as in the previous study.[1] At 6 months post-transplant protocol allograft biopsy, there were no pathological signs for rejection even though the C4d staining was positive. However, it should be noted that if the anti-A and anti-B titres of the patient were 1:256 prior to surgery, then this would be considered as a contraindication for transplantation. However, this level of antibody post-transplantation will not injure the recipient's allograft due to an effect called the 'accommodation', in which the antibody will not damage the allograft.[6] The mechanism of accommodation remains inconclusive but has been proposed by many study groups,[7–10] who assert that this effect is caused by changing B-cell subsets and immunoglobulin subclasses after an ABO incompatible transplantation,[7] whereas in another study, it was claimed that a reduction in the expression of the donor's blood-type antigen on the allograft will result in accommodation.[10] The other possibility is that a reduction in the antibody-antigen interaction or the up-regulation of the complement inhibitors and graft protection genes will result in accommodation. Regardless of the mechanisms involved in accommodation, we have shown that the allograft was successfully accepted by the recipient.

Learning points

- Thorough blood type evaluation must be carried out prior to transplantation and should also include A, B and H antigens, and antibodies.
- Donors with AB para-Bombay are considered as blood type AB and should be paired with recipients who are also AB.
- However, preconditioning for ABO incompatible transplantation can safely be performed in a non-AB recipient receiving a kidney from an AB para-Bombay donor.

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