**NHS BLOOD AND TRANSPLANT**

**KIDNEY ADVISORY GROUP**

# BLOOD GROUP INCOMPATIBLE TRANSPLANTATION IN PREFERENCE TO HLA INCOMPATIBLE TRANSPLANTATION IN THE UKLKSS

## INTRODUCTION

1 The UK Living Kidney Sharing Scheme (UKLKSS) has facilitated both ABO incompatible (ABOi) and HLA incompatible (HLAi) transplants since 2012. In the case of ABOi this relies on centres providing extended blood group matching criteria so that patients can be matched with donors they would otherwise be treated as incompatible with. For HLAi, centres may register a more lenient set of HLA antibodies for paired donation than used for the deceased donor waiting list (DDWL).

2 In practice, of the 24 transplant centres, only 5 have used the facility to try to achieve a blood group incompatible transplant to improve the chances of a match in the scheme for an HLAi pair. This is usually for a pair for whom the centre has not been able to facilitate an antibody incompatible transplant due to the complexity. Four ABOi transplants have been reported through the scheme to date.

3 A number of centres have also registered a lesser set of antibodies for patients in order to achieve an HLAi transplant through the scheme. A small number of transplants identified in the scheme have also proceeded as HLAi following a positive crossmatch test (ie unplanned HLAi transplant).

4 It is now felt that the potential benefit of ABOi transplantation through the scheme should be further explored and perhaps practised more widely. This is likely to be of particular benefit for highly sensitised patients who cannot proceed with a directed HLAi transplant but may more easily find an HLA compatible (HLAc) transplant by considering ABOi as well as ABO compatible (ABOc) transplants. This paper reports results from a study investigating the possibility of improving the transplant rate through the scheme by increasing ABOi transplants identified. The study is based on the pool of patients from the October 2018 matching run.

## MAKEUP OF THE OCTOBER 2018 POOL

5 In the October 2018 matching run, there were 286 patients and 312 paired donors. In addition, there were 18 altruistic donors. Of the 286 patients, 38 were listed with different antibodies than in their DDWL record. Nine patients were listed for potential ABOi transplant by specifying additional acceptable donor blood groups.

## METHODOLOGY

6 To investigate the possibility of increasing the number of ABOi transplants through the UKLKSS, data were additionally obtained from a study carried out at one renal transplant centre (Guy's Hospital). As part of the study Guy's examined all adult patients on the deceased donor waiting list (238 patients) and found that of these, 81 (34%) had baseline anti-A or Anti-B antibody titres of 1:16 or lower. More detailed information is shown in **Table 1** and was used to inform simulations of the UKLKSS.

**Table 1 Estimated proportion of patients with low anti-A or B blood group titres (1:16 or lower)**

| Patient Blood Group | Low titre for | % of patients |
|---|---|---|
| **O** | anti-A | 3 |
| **O** | anti-B | 15 |
| **A** | anti-B | 76 |
| **B** | anti-A | 68 |

7 Statistical software was then used to rerun the October 2018 matching run with data from the national transplant database. The original matching run was replicated using this software to verify the program (the same results were obtained as in the actual matching run). The matching run was repeated, this time not allowing for HLAi transplantation. This was achieved by using only DDWL records of HLA antibody profiles.

8 A hypothetical matching run was then performed with the assumptions that patients in the paired scheme can undergo ABOi with proportions based on low antibody levels as shown in **Table 1**. Thus 15% of ABO-O patients were assumed able to receive ABO-B donors etc. This gave a new, larger list of matches from which a new set of identified transplants could be obtained. The transplants were identified using the kidney optimal matching software (http://kidney.optimalmatching.com/api) developed at the University of Glasgow. We did not allow for HLAi transplants in this run. Because this was based on probabilities of having suitably low-level titres, the run was repeated ten times and averages taken across the ten runs to achieve more reliable estimates of the effect. Results from the different matching runs were then compared.

## RESULTS

9 The original October 2018 matching run identified 85 transplants for 69 pool recipients and 16 patients on the DDWL (at the end of altruistic donor chains (ADCs)). Of the 69 pool recipients, 15 (22%) of the patients were highly

sensitised, of which 2 had modified antibodies recorded compared to DDWL while 2 were listed for potential ABOi transplant through the scheme.

10 **Table 2** shows the numbers of transplants under each of the scenarios. Compared with 85 transplants in the actual run, one was lost if DDWL antibody profiles were assumed (ie HLAi not allowed for). By additionally assuming that 3% of O recipients could receive A donor kidneys, 15% of O recipients could receive B donor kidneys and that 76% of A recipients could receive B donor organs and 68% of B recipients could receive A donor organs, the hypothetical matching run identified an average of 120 transplants. Relative to a scheme in which neither HLAi nor ABOi transplants are undertaken (B: 84 transplants), the current use of HLAi through the scheme (A: 85 transplants) represents a minor benefit. However, if cautiously (ie antibody titres of 1:16 or lower) ABOi transplants through the scheme were considered, the benefit could be more marked (C: 120 transplants), based on the assumptions from the Guy's data.

**Table 2** **Transplants identified in original matching run (MR) and other hypothetical scenarios**

| | 2-way | 3-way | Short Chain | Long Chain | Total |
|---|---|---|---|---|---|
| **(A) Actual MR** | 6 | 10 | 5 | 11 | 85 |
| **(B) No HLAi** | 7 | 9 | 5 | 11 | 84 |
| **(C) ABOi transplants through scheme (average per MR)** | 9.4 | 18.0 | 3.5 | 13.4 | 120 |

11 Further information about the recipients who were identified for transplant is shown in **Table 3**.

**Table 3** **Number of patients identified for transplant by cRF and waiting time**

| | Pool patients identified for transplant | cRF(≥85%) | Long waiters in scheme (5 or more matching runs) |
|---|---|---|---|
| **(A) Actual MR** | 69 | 15 | 10 |
| **(B) No HLAi** | 68 | 14 | 10 |
| **(C) ABOi transplants through scheme (average per MR)** | 103.1 | 24.0 | 13.3 |

12 The blood groups of the donors and patients identified in the matching run are shown in **Table 4**. MR (C) identified 32 ABOi transplants on average across the ten iterations of the MR, these are highlighted in Table 4.

**Table 4 Donor and recipient blood groups for patients identified for transplant**

| **Donor** | **Recipient** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **(A) Actual MR** | **O** | | **A** | | **B** | | **AB** | | Total | |
| O | 30 | (97) | 1 | (3) | 0 | (0) | 0 | (0) | 31 | (100) |
| A | | | 26 | (93) | | | 2 | (7) | 28 | (100) |
| B | 1 | (10) | | | 9 | (90) | 0 | (0) | 10 | (100) |
| AB | | | | | | | 0 | (0) | 0 | (100) |
| **Total** | **31** | **(45)** | **27** | **(39)** | **9** | **(13)** | **2** | **(3)** | **69** | **(100)** |
| **(B) No HLAi** | **O** | | **A** | | **B** | | **AB** | | Total | |
| O | 29 | (97) | 1 | (3) | 0 | (0) | 0 | (0) | 30 | (100) |
| A | | | 26 | (93) | | | 2 | (7) | 28 | (100) |
| B | 1 | (10) | | | 9 | (90) | 0 | (0) | 10 | (100) |
| AB | | | | | | | 0 | (0) | 0 | (100) |
| **Total** | **30** | **(44)** | **27** | **(40)** | **9** | **(13)** | **2** | **(3)** | **68** | **(100)** |
| **(C) ABOi transplants (average per MR)** | **O** | | **A** | | **B** | | **AB** | | Total | |
| O | 36.7 | (94) | 1.7 | (5) | 0.5 | (1) | 0.1 | (0) | 39.0 | (100) |
| A | 2.7 | (6) | 26.1 | (60) | 13.2 | (30) | 1.7 | (4) | 43.7 | (100) |
| B | 11.6 | (63) | 2.7 | (15) | 4.1 | (22) | 0.1 | (0) | 18.5 | (100) |
| AB | 0 | (0) | 1.2 | (63) | 0.7 | (37) | 0 | (0) | 1.9 | (100) |
| **Total** | **51.0** | **(49)** | **31.7** | **(31)** | **18.5** | **(18)** | **1.9** | **(2)** | **103.1** | **(100)** |

## DISCUSSION

13 The results of this study show that increasing the consideration of ABOi transplantation through the UKLKSS on a cautious basis could increase the number of transplants identified.

## ACTION

14 Members are asked to discuss the potential for increasing the number of blood group incompatible transplants through the UKLKSS and how this might be achieved without causing significant increases in delays to transplant or non-proceeding transplants.

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