Patient, kidney, and pancreas survival in pancreas after kidney transplantation versus simultaneous pancreas and kidney transplantation: meta-analysis

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Dear Editor

Both pancreas after kidney transplant (PAK) and simultaneous pancreas and kidney transplant (SPK) are treatment options for patients with type 1 diabetes (T1DM) and end-stage kidney disease (ESKD), but they have different risks and benefits. Presently, SPK is more widespread than PAK because SPK requires only one operation. PAK is a recommended option for patients with living kidney donors to avoid long-term uremia while waiting for cadaveric pancreas transplantation and to increase the survival of allograft kidney transplantation. The aim of this study was to compare PAK and SPK in terms of patient, kidney, and pancreas survival.

Online databases were used to locate studies of patients with T1DM and ESKD undergoing PAK and SPK up to 20 January 2022 (Supplementary material and Fig. S1). A total of 47,986 patients were identified from 24 studies, including 9093 patients undergoing PAK and 38,893 patients undergoing SPK (Table S1). Patient, kidney, pancreas survival rate as well as human leucocyte antigens (HLA) mismatch rate in patients undergoing PAK versus SPK at 1, 3, 5, and 10 years in the included studies are shown in Table 1. Quality ranged on the Newcastle–Ottawa Scale from six to nine (Table S2).

The definitions of pancreas and kidney rejection, the rejection ratios of PAK and SPK, and the details of the rejection treatment used in all the included articles are given in Table S3.

Patients with PAK had a significantly higher 1-year patient survival than patients with SPK (OR 1.11, 95 per cent c.i. 1.00 to 1.24), whereas patients with PAK had a lower 10-year patient survival than patients with SPK (OR 0.73, 95 per cent c.i. 0.67 to 0.79) (Fig. S2). Patients with PAK had a higher 1-year (OR 5.72, 95 per cent c.i. 4.38 to 7.48), 3-year (OR 2.51, 95 per cent c.i. 2.21 to 2.84), 5-year (OR 1.74, 95 per cent c.i. 1.37 to 2.21), and 10-year (OR 1.25, 95 per cent c.i. 1.16 to 1.36) kidney graft survival than after SPK (Fig. S3), but lower 1-year (OR 0.79, 95 per cent c.i. 0.66 to 0.94), 3-year (OR 0.55, 95 per cent c.i. 0.46–0.65), and 5-year (OR 0.55, 95 per cent c.i. 0.44 to 0.69) pancreas graft survival than after SPK (Fig. S4). The incidence of pancreas rejection (OR 2.37, 95 per cent c.i. 1.47 to 3.85) and the HLA mismatch rate (OR 2.22, 95 per cent c.i. 1.19 to 4.15) were higher in patients with PAK than with SPK (Figs. S5 and S6).

Patients with SPK have better long-term survival than patients with PAK, which may indicate that rejection is difficult to detect without simultaneous kidney transplantation. Kidney graft survival in PAK is significantly better, in part due to selection bias, as only recipients with good renal function after kidney transplantation will proceed to pancreas transplantation. Another main reason for higher kidney graft survival in the PAK group was that the proportion of living donors was significantly higher. The pancreas graft long-term survival rate in PAK is still slightly lower than that of SPK, and an adverse pancreas outcome after PAK may be due to technical complications and immunological issues. Higher graft survival yields lower mortality and preventing both immune and non-immune causes of graft failure is critical in reducing post-transplant mortality.

This study has some limitations, the studies included a large range of years, and earlier transplantation technology had a certain impact on the patient survival and graft survival of the two groups (SPK versus PAK recipients had a higher incidence of kidney graft loss due to technical reasons in 2000: 2.1 per cent versus 0 per cent). At present, the technical failure rate of SPK as a cause of allograft failure is similar to that of PAK. Furthermore, limited to the results in the included literature, the effects of other post-transplant complications, such as thrombosis, infection, obesity, smoking, and coronary heart disease, were not taken into account.

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Supplementary material
Supplementary material is available at BJS Open online.

Data availability
The data underlying this article are available from the corresponding authors upon request.

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| First author                          | Total number of recipients | Patient survival rate for the following years | Kidney survival rate for the following years | Pancreas survival rate for the following years | HLA mismatch rate |
|--------------------------------------|----------------------------|-----------------------------------------------|---------------------------------------------|-----------------------------------------------|-------------------|
| Abhinav Humar s1                     | 205                        | 1(96 versus 91):3(90 versus 90)               | 1(100 versus 85):3(89.6 versus 83.6)         | 1(77.9 versus 78):3(61.7 versus 74.1)         | 1.3 versus 1.6    |
| Ayhan Dinckan s2                     | 34                         | 5(97 versus 95.2)                             | NA                                          | 1(79.4 versus 85.7):3(70.6 versus 71.4)       | 8.8 versus 14.3   |
| B.L. Kasiske s3                      | 1230                       | 1(95.5 versus 96)                             | NA                                          | 1(82 versus 88)                               | NA                |
| Bor-Uei Shyr s4                      | 24                         | 1(96 versus 97):3(96 versus 97)               | 3(91.2 versus 95.2)                         | 1(100 versus 100):3(100 versus 100)          | 12.5 versus 8.8   |
| Edmund Huang s5                      | 389                        | 1(100 versus 98):3(96 versus 95):5(88 versus 91) | 1(100 versus 95):3(95 versus 90):5(83 versus 80) | 1(81.7 versus 86):3(70 versus 81):5(74 versus 74) | 8.5 versus 2.4    |
| Farney s6                            | 17                         | 1(70 versus 84)                               | 1(100 versus 89)                            | 1(100 versus 95)                              | 17 versus 19.5    |
| Friddel JA s7                        | 61                         | 1(98 versus 99):3(90 versus 90)               | 1(98 versus 96):3(92 versus 90)              | 1(95 versus 90):3(88 versus 85)               | 6.6 versus 2.8    |
| Jens Gunther                         | 17                         | 1(100 versus 100):3(100 versus 100)           | 1(88 versus 100)                            | 1(88 versus 100)                              | NA                |
| Jonathan A Friddel s10               | 3358                       | 1(94 versus 93.7):3(88 versus 89):5(83 versus 86.4):10(63.2 versus 70) | 1(93.7 versus 85.3):3(93.7 versus 85.5):5(83 versus 85):10(66.6 versus 70) | 1(84.4 versus 87.5):3(69 versus 86.4):5(57 versus 86.7) | 14.1 versus 14.1  |
| Muthusamy s11                        | 15                         | NA                                            | NA                                          | 1(80 versus 90):3(60 versus 80)               | 19.4 versus 20     |
| M. Laftavi s12                       | 23                         | 1(96 versus 100):3(87 versus 88):5(87 versus 88:108 versus 88) | 1(96 versus 90):3(87 versus 90:5(83 versus 90):108 versus 84) | 1(80 versus 96):3(87 versus 90):5(83 versus 90:108 versus 84) | 19.2 versus 40     |
| M. Durlik s13                        | 9                          | 1(88 versus 86):2(388 9 versus 88:5(88 versus 88) | 1(100 versus 87:3(100 versus 85:5(100 versus 100:100 versus 80) | 1(100 versus 87:3(100 versus 85:5(100 versus 100:100 versus 80) | NA                |
| Nedo Poompinapanit s14               | 807                        | 1(95 versus 94):3(92 versus 90:5(86 versus 86) | 1(98 versus 93:3(94 versus 85:5(85 versus 77) | 1(81 versus 86):3(65 versus 78:5(55 versus 73) | 0.45 versus 0.08  |
| Perosa M. s15                        | 94                         | 1(92.5 versus 81.8):3(91.5 versus 78:5(90.4 versus 75.2) | 1(90.5 versus 90:3(100 versus 90:5(100 versus 90:100 versus 80) | 1(93.3 versus 96):3(72 versus 90:5(61 versus 82:10(27.8 versus 80) | 16.1 versus 2.2   |
| Pedro Ventura-Aguiar s16             | 18                         | 1(100 versus 98:3(83 versus 95:5(77.8 versus 92:107.7 versus 90) | 1(100 versus 98:3(100 versus 95:5(100 versus 100 versus 88) | 1(83.3 versus 96:3(72 versus 90:5(61 versus 82:10(27.8 versus 80) | NA                |
| Rainer WG s17                        | 1714                       | 1(95 versus 95):3(88 versus 90)               | 1(95 versus 95):3(88 versus 90)              | 1(70 versus 82:3(66 versus 80:5(62 versus 69) | NA                |
| Robert Gilling s18                   | 47                         | 1(95 versus 95):3(88 versus 90)               | 1(95 versus 95):3(88 versus 90)              | 1(70 versus 82:3(66 versus 80:5(62 versus 69) | 7.7 versus 2.8    |
| R.J. Stratta s19                     | 35                         | 5(86 versus 86)                               | 5(80 versus 74)                              | 3(100 versus 89):3(85 versus 85:5(83 versus 80:10(83 versus 70) | 11.3 versus 0.7   |
| Sandesh Parajuli s20                 | 24                         | 5(86 versus 86)                               | 1(100 versus 95:3(96 versus 90:5(96 versus 85:10(96 versus 75) | 1(87 versus 92):3(81 versus 92:5(81 versus 70) | NA                |
| Timothy S. Larson s21               | 47                         | 1(93.6 versus 100:3(85 versus 100:5(81 versus 90) | 1(100 versus 100:3(100 versus 100:5(100 versus 100) | 1(95 versus 100:3(100 versus 100:5(100 versus 100) | NA                |
| Tadahiro Uemura s22                  | 5                          | 1(100 versus 100:3(100 versus 100:5(97 versus 88) | 1(100 versus 100:3(100 versus 100:5(100 versus 100) | 1(100 versus 87:5:3(64 versus 86:5(68.7 versus 82.8) | 8.8 versus 5.5    |
| T. Ito s23                           | 39                         | 1(100 versus 100:3(100 versus 100:5(97 versus 88) | 1(100 versus 100:3(100 versus 100:5(100 versus 100) | 1(100 versus 87:5:3(64 versus 86:5(68.7 versus 82.8) | 8.8 versus 5.5    |
| Tomimaru s24                         | 48                         | NA                                            | NA                                          | 1(85 versus 87:3(66.7 versus 85.5:5(52 versus 83:10(42 versus 74.7) | NA                |

Values are 6 (PAK:SPK). HLA, human leucocyte antigen; PAK, pancreas after kidney transplant; SPK, simultaneous pancreas and kidney transplant; NA, not available. References to the studies can be found in Supplementary material.

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