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Different diagnostic approaches to adult candidates for cadaveric kidney transplantation in Europe

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Abstract We investigated which diagnostic procedures are mandatory for all transplant candidates irrespective of their individual situation in European transplant centres, how homogeneously these are applied and what centre characteristics determine differences in the diagnostic approach. A questionnaire was sent to European renal transplant centres asking which of 45 listed diagnostic procedures are mandatory for every transplant candidate. The 154 participating centres require 15.6 ± 5.6 (4–33) mandatory tests, with significantly less mandatory diagnostics in centres in the UK (8.5 ± 3.9) and Scandinavia (9.8 ± 2.3). Geographic location is the single significant factor in multifactorial analysis of possibly related factors. Detailed analysis revealed 16 tests that are required significantly less often in the north of Europe. There are significant differences in the evaluation of renal transplant candidates across Europe. In some parts of Europe transplant candidates are either investigated more discriminately or less comprehensively than in other regions.

Key words Kidney transplantation · Pretransplant diagnostic evaluation · Waiting list · Geographic factors

Introduction

Before they are accepted on the waiting list for a cadaveric renal transplant, patients are thoroughly investigated with a number of diagnostic procedures. The aim of this process is to determine the risk the patient will incur by transplantation and the ensuing medical treatment. The diagnostic findings provide the basis for the decision whether to accept the candidate for the transplant waiting list. Furthermore these findings allow the taking of prophylactic measures where an identified risk factor can be improved by intervention.

While it may seem desirable to know as much about a patient's medical situation as possible, it is neither feasible nor rational to subject a transplant candidate to all available diagnostic procedures. Only diagnostic procedures that are deemed to be absolutely necessary in the preparation for a kidney transplantation will be mandatory for all patients who apply for the waiting list of a transplant centre. Thus every transplant centre has a set of diagnostic procedures that are performed on all transplant candidates irrespective of their individual situation. Theoretically, this set of mandatory diagnostics could be the same in every transplant centre. We performed this investigation to describe which diagnostic procedures are mandatory in European transplant centres, how homogeneously they are applied across Europe and what centre characteristics determine differences between the sets of mandatory diagnostics.

Table 1 Diagnostic tests required for every renal transplant candidate. Percentage of transplant centres in Europe *(second column)* and in parts of Europe *(third to eight column)* performing a diagnostic test on every adult candidate for a cadaveric renal allograft. *P* values are quoted where routine use of a diagnostic test differs significantly between different parts of Europe (chi-squared best). (*n. s.* not significant, *n. a.* not applicable)

Diagnostic test	Europe (%)	Euro-transplant (%)	Southern Europe (%)	Western Europe (%)	UK (%)	Scandinavia (%)	Eastern Europe (%)	*P* value
Hep C antigen	99.4	100.0	100.0	96.0	100.0	100.0	100.0	n.s.
Hep C antibodies	98.7	100.0	100.0	100.0	90.0	100.0	100.0	n.s.
CMV antibodies	97.4	100.0	100.0	96.0	85.0	100.0	100.0	0.009
Chest X-ray	94.2	94.5	100.0	100.0	75.0	90.0	100.0	0.003
Resting ECG	92.9	90.9	97.5	100.0	80.0	90.0	100.0	n.s.
Hep B antibodies	90.3	92.7	95.0	96.0	70.0	90.0	75.0	n.s.
EBV serology	76.0	78.2	85.0	96.0	35.0	70.0	50.0	0.000
Abdominal ultrasound	64.9	85.5	87.5	56.0	0.0	10.0	75.0	0.000
Gynaecologic consultation	61.7	76.4	70.0	80.0	5.0	10.0	75.0	0.000
Dental consultation	61.0	90.9	30.0	84.0	15.0	60.0	50.0	0.000
Plain pelvic X-ray	59.7	56.4	95.0	72.0	15.0	0.0	50.0	0.000
Urologic consultation	55.8	67.3	70.0	64.0	0.0	20.0	75.0	0.000
Syphillis screening	47.4	47.3	62.5	56.0	20.0	20.0	50.0	n.s.
Echocardiograpy	44.2	49.1	45.0	72.0	20.0	0.0	25.0	0.001
Toxoplasma serology	43.5	30.9	62.5	76.0	10.0	30.0	25.0	0.000
Voiding cysturetrogram	39.6	41.8	62.5	52.0	0.0	0.0	0.0	0.000
Ear-nose-throat	37.7	69.1	7.5	60.0	0.0	0.0	50.0	0.000
Ophthalmologic	37.0	60.0	35.0	36.0	0.0	0.0	25.0	0.000
PSA	37.0	27.3	67.5	52.0	5.0	0.0	25.0	0.000
Hepatitis C genome (PCR)	30.5	29.1	35.0	36.0	25.0	10.0	50.0	n.s.
Gastroscopy	27.9	32.7	35.0	32.0	0.0	20.0	25.0	n.s.
Tuberculosis skin test	20.8	25.5	35.0	12.0	0.0	0.0	25.0	n.s.
CMV antigen	18.8	29.1	5.0	20.0	15.0	20.0	25.0	n.s.
Peripheral Doppler	18.2	14.5	15.0	44.0	15.0	0.0	0.0	n.s.
Hepatitis B genome (PCR)	15.6	20.0	5.0	20.0	20.0	10.0	25.0	n.s.
Dermatologic consultation	14.3	30.9	0.0	16.0	5.0	0.0	0.0	0.000
Lung-function test	13.0	21.8	10.0	12.0	0.0	10.0	0.0	n.s.
Excercise ECG	12.3	29.1	0.0	8.0	5.0	0.0	0.0	0.000
CMV genome	11.7	12.7	10.0	8.0	15.0	10.0	25.0	n.s.
Gujak test	11.7	18.2	7.5	8.0	5.0	10.0	25.0	n.s.
AFP	9.1	10.9	10.0	4.0	10.0	0.0	25.0	n.s.
CA-125 in women	7.8	5.5	12.5	12.0	5.0	0.0	0.0	n.s.
CEA	7.8	9.1	10.0	4.0	5.0	0.0	25.0	n.s.
CA 19-9	6.5	5.5	7.5	12.0	0.0	0.0	25.0	n.s.
Neurologic consultation	6.5	12.7	2.5	4.0	0.0	0.0	25.0	n.s.
Carotid Doppler	5.8	5.5	2.5	16.0	5.0	0.0	0.0	n.s.
Cystoscopy	5.8	10.9	5.0	4.0	0.0	0.0	0.0	n.s.
Psychiatric consultation	3.2	1.8	7.5	4.0	0.0	0.0	0.0	n.s.
Barium enema	2.6	3.6	5.0	0.0	0.0	0.0	0.0	n.s.
Orthopaedic	2.6	1.8	7.5	0.0	0.0	0.0	0.0	n.s.
Holter ECG	1.9	3.6	0.0	4.0	0.0	0.0	0.0	n.s.
Myocardial scintigraphy	1.9	1.8	0.0	8.0	0.0	0.0	0.0	n.s.
Coloscopy	1.3	3.6	0.0	0.0	0.0	0.0	0.0	n.s.
Iliaco-femoral angiography	1.3	1.8	0.0	0.0	5.0	0.0	0.0	n.s.
Coronary angiography	0.0	0.0	0.0	0.0	0.0	0.0	0.0	n.a.

Materials and methods

Transplant centres performing cadaveric renal transplants in adults from 20 European countries (members of the European community plus Czech Republic, Finland, Hungary, Norway and Switzerland) were identified by lists provided by the respective organisations for organ sharing. The name and address of the contact person for each centre were either provided by these organisations or acquired by direct telephone call to the centres.

During 1998 a questionnaire was sent to the contact person in every identified transplant centre. This questionnaire listed 45 diagnostic procedures (9 consultations of clinical specialties, 18 imaging techniques and 18 laboratory investigations; Table 1). Those procedures mandatory for every adult candidate for a cadaveric renal transplant were to be marked in a corresponding check-box. The respondents were specifically asked to "describe the actual situation in your centre not your opinion how it should be".

The total number of mandatory diagnostic procedures was counted for each centre. This number was examined for differences according to centre characteristics by ANOVA:

1. Size of the centre (as determined by the number of cadaveric renal transplants in adults performed in 1996).
2. Legal status of the transplant centre (university hospital vs other).
3. Institution mainly responsible for the performance of the diagnostic work (transplant centre vs dialysis centre).
4. Geographic location of the centre. It was recorded to which of six European regions the centre belongs (Eurotransplant: Austria, Belgium, Germany, Holland and Luxembourg; Southern Europe: Italy, Portugal and Spain; Western Europe: France and Switzerland; UK: England, Northern Ireland, Scotland and Wales; Scandinavia: Denmark, Finland, Norway and Sweden; Eastern Europe: Czech Republic and Hungary).

Statistical significance of the factors and their interactions was then tested by ANCOVA; relevance was expressed as the proportion of the variance accounted for by the factor (eta-squared). Results for each possible response were expressed as the percentage of the total number of responding centres. This percentage was tested for differences in distribution by the chi-squared test in contingency tables for the centre factors found to be significant in the first part. All differences with a P value below 0.01 were considered significant. Data were analysed using the statistical package for Social Sciences (SPSS for Windows V 7.5).

Results

A total of 154 centres participated in the survey (Eurotransplant: 55; Southern Europe: 40; Western Europe: 25; UK: 20; Scandinavia: 10; Eastern Europe: 4). The average number of diagnostic tests mandatory for every prospective transplant recipient is 15.6 ± 5.6 (4–33) in the participating European centres. The centres in the Eurotransplant region and Western Europe have the highest number of mandatory diagnostic procedures (17.7 ± 4.7 and 17.8 ± 5.0, respectively) whereas significantly less procedures are required in Scandinavia (9.8 ± 2.3) and the UK (8.5 ± 3.9) for every transplant candidate (Southern Europe: 16.3 ± 4.5; Eastern Europe: 15.3 ± 5.1). The multifactorial analysis showed that geographic location is the single significant factor explaining a large proportion of the observed variance (eta-squared: 0.26) while all other factors (centre size, legal status, responsibility for diagnostic preparation) and factor interactions were not significant (total eta-squared of these factors together: 0.10).

Separate analysis for each surveyed diagnostic procedure showed which procedures are handled differently in different parts of Europe (Table 1). For instance abdominal ultrasound is performed without any further indication on every transplant candidate in 86% of Eurotransplant and 88% of South European centres but in none of the British and only 10% of the Scandinavian centres ($P < 0.001$). None of the surveyed diagnostic procedures is mandatory more frequently in the UK or Scandinavia than in the other European regions.

Discussion

In 1992 Ramos et al. surveyed the current practice of USA transplant centres in the evaluation of candidates for renal transplantation and found a heterogeneous approach in several medical fields [6]. Consequently the Patient Care and Education Committee of the American Society of Transplant Physicians developed and issued clinical practice guidelines for the evaluation of transplant candidates [2]. Later the evaluation of living renal donors was surveyed and clinical practice guidelines were published [1, 3] and the American Society of Transplant Physicians reached consensus recommendations for standardised listing criteria for renal transplant candidates [4, 5]. Up to now, the evaluation process in the European transplant centres has never been surveyed, therefore it is unknown whether the situation in Europe is as heterogeneous as it was found to be in the USA. Meanwhile the European legislators begin to take the criteria by which eligibility for a renal transplant is decided into account for new regulations (for example in the new German transplantation law, uniform criteria are demanded without further specification).

Those diagnostic procedures that are performed on every transplant candidate without regard for the patient's individual situation (i.e. the mandatory diagnostic tests) are best suited to compare the diagnostic approach of different transplant centres because by definition they are independent of special patient situations. Which tests are mandatory in a transplant centre is important for the patients as they can be inconvenient, time-consuming and potentially harmful on the one hand while on the other hand reducing the danger that existing risk factors remain undetected. Transplant centres in a competitive situation will find that their choice of mandatory diagnostic tests affects the speed, cost effectiveness and practicability of the evaluation process for transplant candidates.

We found a surprisingly wide range in the number of mandatory diagnostic tests with some centres performing nearly ten times more mandatory tests than those centres with the fewest mandatory tests. The size and legal status of the transplant centre as well as the distribution of the responsibility to perform the diagnostic work-up between transplant and dialysis centre does not affect the number of mandatory tests, while the geographic location in Europe is the major determinant of this number in our observation. The detailed analysis (Table 1) shows where these differences stem from. As expected, basic virologic laboratory tests are performed uniformly in nearly all European centres and invasive

procedures such as cystoscopy, coloscopy, iliaco-femoral and coronary angiography are almost never a routine investigation in the absence of an individual indication. But several investigations that require either machinery (chest X-ray, abdominal ultrasound, pelvic X-ray, echocardiogram) or consultation of a specialist (gynaecologic, dental, urologic, opthalmologic, etc.) are significantly less often mandatory in Scandinavia and the UK than in the rest of Europe. Whether this is due to a more differentiated approach with a diagnostic work-up tailored to the situation of the individual patient as assessed by the attending physician or whether this is due to a less comprehensive evaluation that is restricted just to the investigations deemed to be absolutely necessary in a centre can not be distinguished in this analysis. But these data clearly demonstrate different attitudes across Europe in weighing the danger of missing existing risk factors against the likelihood of performing diagnostic tests that are unnecessary for an individual patient. Hopefully these findings will encourage further discussion and investigation of the evaluation process for renal transplant candidates in Europe.

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References

1. Bia MJ, Ramos EL, Danovitch GM, Gaston RS, Harmon WE, Leichtman AB, Lundin PA, Neylan J, Kasiske BL (1995) Evaluation of living renal donors. Transplantation 60: 322–327
2. Kasiske BL, Ramos EL, Gaston RS, Bia MJ, Danovitch GM, Bowen PA, Lundin PA, Murphy KJ (1995) The evaluation of renal transplant candidates: clinical practice guidelines. J Am Soc Nephrol 6: 1–33
3. Kasiske BL, Ravenscraft M, Ramos EL, Gaston RS, Bia MJ, Danovitch GM (1996) The evaluation of living renal transplant donors: clinical practice guidelines. J Am Soc Nephrol 7: 2288–2306
4. Nelson S (1998) Listing criteria for solid organ transplantation. Transplantation 66: 946–947
5. Nelson S (1998) Consensus conference on standardized listing criteria for renal transplant candidates. Transplantation 66: 962–967
6. Ramos EL, Kasiske BL, Alexander SR, Danovitch GM, Harmon WE, Kahana L, Kiresuk TJ, Neylan JF (1994) The evaluation of candidates for renal transplantation. Transplantation 57: 490–497