dialysis; however, insulin resistance remains elevated in insulin-treated diabetic patients after the start of haemodialysis [2]. In our study, we evaluated the insulin requirement during the first dialysis year in insulin-treated type 2 diabetic patients.

A total of 24 insulin-treated type 2 diabetic patients [age 62 ± 9 years, female/male (9 : 15)], who had been at least 1 year on haemodialyis therapy, were selected for this study.

Patients were divided into two groups according to their diuresis: a group 1, of patients with preserved near-normal urine production (>1 l/day) during the first dialysis year ($n = 12$), and a group 2, of patients with significant reduction of urine excretion (<0.5 l/day) within 3 months after start of dialysis ($n = 12$). All patients were dialysed three times per week (total dialysis time 12 h weekly). The HbA1c- and FBG-values as well as the BP-values were similarly high in both groups and did not significantly change during the 1-year observation period. In group 1, the Cr-Cl dropped from 11 ± 4 ml/in at the start of dialysis to 6 ± 2 ml/min after 1 year. In group 2, the Cr-Cl decreased from 10 ± 4 ml/min to 1 ± 1 ml/min during the same time. The insulin requirement in the patients with normal diuresis decreased from 24 ± 8 IU/day at the start of dialysis to 14 ± 8 IU/day 1 year later (41% reduction, $P < 0.05$). In the group with reduced diuresis, the required insulin dose remained the same with 28 ± 12 and 26 ± 8 IU/day, respectively (7% reduction). The kidney plays a pivotal role in the clearance and degradation of circulating insulin and is also an important site of insulin action [3]. In the presence of impaired renal function, insulin clearance is prolonged [1], and therefore, insulin requirement is decreased, though insulin resistance frequently accompanies end-stage renal disease.

We agree that the conclusions in our study are limited due to the small patient groups. The C-peptide levels were not significantly different in both groups, therefore, residual β-cell function obviously had no impact on the insulin requirement under haemodialysis. In a study with type 1 diabetic patients with moderate renal insufficiency, it was reported that their insulin levels were higher than in diabetic patients with normal renal function [4].

Thus, according to the results in our study, it can be concluded that also under dialysis, residual renal function (GFR) has an impact on insulin requirement. In insulin-treated type 2 diabetic patients, early reduction of diuresis significantly decreases insulin requirement.

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## Delayed near-fatal anaphylactic reaction induced by the F10-HPS polysulphone haemodialyser

Sir,

Polysulphone membranes are biocompatible materials that are widely used in haemodialysis. The use of these membranes during haemodialysis rarely causes any anaphylatic reaction [1]. Here, we briefly describe a delayed life-threatening syndrome of anaphylaxis during haemodialysis with a polysulphone dialyser.

A 67-year-old female with renal failure due to chronic glomerulonephritis had started haemodialysis in 1996. She had a history of atrial fibrillation without asthma or any drug or food allergies. The patient had hypertension and was treated with calcium channel blockers, but not with angiotensin-converting enzyme inhibitors (ACEIs). She had been dialysed with cellulose diacetate hollow fibre (Dicea210 G, Baxter, USA) since 1996. On 24, April 2007, the membrane was changed due to the lack of the cellulose hollow fibre to a steam-sterilized polysulphone capillary dialyser (F10 HPS, Fresenius) that had never been used by the patient. There were no other changes in the medical treatment. The expected amount of body water to be removed was 1.7 l. Heparin was given at a loading dose of 1000 units with a maintenance dose of 500 units/h. Before haemodialysis, the patient was well and showed normal vital signs. At the start of haemodialysis, blood pressure was measured as 140/70 mmHg and body temperature was 36°C. Five minutes after the start of haemodialysis, the patient developed palpitations and some chest tightness. No pruritus, urticaria, dyspnoea or hypotension were noted. EKG monitoring showed normal sinus rhythm with HR 70–90/min. Symptoms improved after $O_2$ supplementation was done along with nasal cannula. At 2 h after the start of haemodialysis, a low grade dyspnoea was noted. Physical examination revealed a left low-lung focal wheezing without rales. Treatment was carried out in the form of intravenous (i.v.) solucortef (100 mg). Two minutes later, orthopnoea occurred and the patient coughed out large amounts of pink frothy sputum. Blood pressure was 140/90 mmHg. Physical examination revealed bronchospasm and generalized pulmonary rales. No pathological Q or T waves were noted during the EKG monitoring. The patient suddenly lost consciousness. Intubation was performed, due to these changes and we found that the patient had severe laryngeal oedema. Because of the pulmonary oedema, we decided to carry on haemodialysis, and the hollow fibre was changed to a different cellulose diacetate hollow fibre (Dicea170 G, Baxter, USA). Finally, 31 of body water was removed. The patient was admitted to intensive care and was given steroids, antihistamine, epinephrine, vasopressors, oxygen, intubation and cardiac massage. After admission to the intensive care unit, CXR of the patient showed low grade pulmonary oedema following the removal of 31 of body water After 4 days, CXR revealed no fluid accumulation in either of the lungs. Initial laboratory data after resuscitation and

haemodialysis showed leucocytes 24 090/mm$^3$ (94.2% neutrophils; 0% eosinophils), haemoglobin 11.0 g/dl and platelets 202 000/mm$^3$. Blood glucose was 222 mg/dl, sodium 143 mEq/l, potassium 3.8 mEq/l, calcium 9.6 mg/l, albumin 3.4 g/dl, uric acid 6.6 mg/dl, amylase 75 U/L, lipase 65 U/L, alanine aminotransferase (ALT) 30 U/l, aspartate aminotransferase (AST) 46 U/l, creatinine kinase-MB (CK-MB) 10.9 U/l, troponin-I 0.13 ng/ml, C-reactive protein quantative 0.2 mg/dl and IgE 344.4 IU/ml. Blood gas analysis showed pH 7.47, $PaO_2$ 80.1 mmHg, $O_2$ saturation 96.1%, and $PCO_2$ 35 mmHg. Echocardiograms revealed adequate left ventricular function with mild mitral valve regurgitation. During the follow-up, regular haemodialysis was given three times a week with cellulose diacetate hollow fibre (Dicea170 G, Baxter, USA), and no anaphylaxis occurred.

In summary, we describe a delayed near-fatal anaphylactic reaction induced by a polysulphone haemodialyser. Although hypersensitivity to biocompatible dialysers is rare and usually occurs during initial haemodialysis, doctors and members of haemodialysis centers should keep in mind that a risk of severe anaphylaxis may occur at any time during a prolonged haemodialysis treatment.

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## Haemodialysis in a patient with haemophilia B

Sir,

I would like to raise a problem of preparation for haemodialysis (HD) in patients with a mild type of haemophilia B. Chronic renal failure is a very rare condition in haemophiliacs and/or individuals with other hereditary clotting disorders and the dialysis modality for these patients may be a difficult choice.

A 53-year-old man with haemophilia B, mild hypertension, hepatitis C virus infection (anti-HCV positive) developed end-stage renal disease (ESRD), most probably due to chronic glomerulonephritis. Preparation for HD was undertaken in accordance with the patient's choice (HD or PD) at an eGFR of 12 ml/min/1.73 m$^2$. Laboratory data showed a prolonged activated partial thromboplastin time (aPTT) of 82 s and factor IX activity of 8.6% (mild type of haemophilia B). All other coagulation factor levels were normal. It is worthy of note that the patient was admitted to our clinic with a diagnosis of severe haemophilia B, based on a factor IX activity of 0.1%, assessed 24 years previously.

To create the vascular access, intensive treatment with coagulation factor IX was given to achieve the target level (35–40%) for small surgical procedures. The calculated dose was administered, as recommended, intravenously 1 h before creation of the fistula and then every 12 h for two consecutive days. The successfully created wrist arteriovenous fistula was complicated by a small haematoma. Twenty days after fistula creation, the patient started HD using a small-size (17 G) single needle without systemic/local anticoagulation. Two-needle dialysis was introduced 4 weeks after fistula placement. During the 6 months of follow-up, no bleeding episodes after needle removal and no clotting in dialyzers or drains were observed. There was no need for factor IX substitution during and after the dialysis sessions.

The modality of dialysis in patients with hereditary clotting disorders is a difficult choice. When considering haemodialysis, intensive treatment with coagulation factors is crucial for vascular access creation and in some severe cases for the HD procedure as well. Peritoneal dialysis has been performed infrequently in haemophiliacs. The clinical results of PD treatment may fluctuate between an uncomplicated course, when coagulation replacement therapy is required only during peritoneal catheter placement, and rather serious complications such as haemoperitoneum episodes [1].

An important issue in the preparation for renal replacement therapy is the evaluation of factor IX activity. In our patient we noticed an increase in factor IX activity within 24 years (from 0.1 to 8.6%), which resulted in a lower dose of substituted factor IX prior to the surgical procedure. In recent publications, factor IX, a circulating serine protease, has been shown to increase with age in humans [2]. Kurachi *et al*. [3] investigated the mechanisms of the age regulation of the human factor IX gene. They identified two genetic elements: an age-related stability element (ASE, GAGGAAG) and an age-related increase element (AIE, a unique stretch of dinucleotide repeats), which were responsible for age-related stable and increasing expression patterns, respectively. The molecular weight of factor IX has been estimated to be between 65 and 72 kDa, depending on the method of assessment [4]. Therefore it is unlikely that a higher level of factor IX is because of low GFR (cutoff of the glomerular basement membrane ~60 kDa) [5].

In conclusion, HD is a good therapeutic option for patients with a mild type of haemophilia B and ESRD requiring dialysis. Prolonged aPTT allows for HD without anticoagulation. Re-evaluation of the severity of haemophilia is advisable, due to the age-related increase in factor IX activity which may contribute to the proper management of the patient.

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