Renal Disease in the Past

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Introduction

• Discuss 1960-1980
• Limited development prior to this
• Kolff created first practical artificial kidney
• Debate about the benefits of diet vs. dialysis
Areas covered

- Dialysis
- Vascular access
- Home haemodialysis
- Complications of RRT (incl. hepatitis)
- Renal bone disease
- Aluminium toxicity
- Kidney transplantation
The use of bicarbonate & acetate as the dialysate buffer

<table>
<thead>
<tr>
<th></th>
<th>Chronic Intermittent Haemodialysis</th>
<th>Acute Haemodialysis (normal sodium)</th>
<th>Acute Haemodialysis (low sodium)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ionic Concentrations (mMol/1)</td>
<td>Ionic Concentrations (mMol/1)</td>
<td>Ionic Concentrations (mMol/1)</td>
<td></td>
</tr>
<tr>
<td>Na⁺</td>
<td>133</td>
<td>139.61</td>
<td>129.69</td>
</tr>
<tr>
<td>K⁺</td>
<td>1.5</td>
<td>3.5</td>
<td>3.5</td>
</tr>
<tr>
<td>Ca²⁺</td>
<td>1.51</td>
<td>1.27</td>
<td>1.27</td>
</tr>
<tr>
<td>Mg²⁺</td>
<td>.75</td>
<td>.49</td>
<td>.49</td>
</tr>
<tr>
<td>Cl⁻</td>
<td>92.8</td>
<td>112.8</td>
<td>102.8</td>
</tr>
<tr>
<td>HCO₃⁻</td>
<td>-</td>
<td>26.79</td>
<td>26.79</td>
</tr>
<tr>
<td>Acetate Base</td>
<td>46.8</td>
<td>6.99</td>
<td>6.99</td>
</tr>
<tr>
<td>Lactate</td>
<td>-</td>
<td>1.33</td>
<td>1.33</td>
</tr>
</tbody>
</table>

Dextrose 200mg/100ml 400mg/100ml 400mg/100ml
Efficient machine; infection uncommon

Problems
• Air embolism
• Time consuming
• Membrane rupture
• Poor control of fluid removal
Kiil board: the first artificial kidney that could be used with a *proportionating* machine
Edinburgh Royal Infirmary Dialysis Unit c.1965
Progress in vascular access
Home haemodialysis installation
Complications in haemodialysis patients

- Peripheral neuropathy
- Pericarditis
- Hyperlipidaemia
- Pruritus
- Fluid and electrolyte disturbance
- Infection
- Hepatitis
- Psychological disorders
- Blood loss/hypovolaemia/air embolism/disequilibrium syndrome
- Anaemia
- Hypertension
- Renal osteodystrophy
- Dialysis dementia
PRE DIALYSIS PLASMA UREA AND CREATININE IN PATIENTS TREATED BY HAEMODIALYSIS TWICE WEEKLY
CHANGES IN BRAIN WATER WITH HAEMODIALYSIS

$\Delta T_1(\text{ms})$

$\Delta$ PLASMA OSMOLALITY (mOsm/kg)

$r = 0.92$

$p < 0.005$

Winney Kean et al., 1986.
Factors in Dialysis-induced Hypotension

- Autonomic Neuropathy
- Membrane Biocompatibility Hypoxia
- Decreased ECF Volume Extracorporeal Volume Ultrafiltration Serum osmolality changes

Vasodilatation

Dialysate temperature
- Antihypertensive drugs
- Acetate dialysis
- Dialysate Potassium
- Dialysate calcium
- Arrhythmias

Hypotension

Decrease C.O.

Underlying Cardiac Disease
Hepatitis outbreak
Dialysis-Associated Hepatitis in Edinburgh; 1969–1978

B. P. Marmion, C. J. Burrell, R. W. Tonkin, and J. Dickson

From the Department of Bacteriology, Edinburgh University Medical School, Edinburgh, Scotland; and the Division of Medical Virology, Institute of Medical and Veterinary Science, Adelaide, South Australia
## Incidence of Hepatitis in Staff and Patients in 4 Units Experiencing Outbreaks and in 17 Units Without Outbreaks (1969)

<table>
<thead>
<tr>
<th></th>
<th>1969</th>
<th>Category</th>
<th>No. of persons in unit</th>
<th>No. of cases</th>
<th>Attack Rate per 100 persons</th>
<th>Attack Rate per 100 person weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>4 units</strong></td>
<td><strong>1969</strong></td>
<td><strong>Category</strong></td>
<td><strong>No. of persons in unit</strong></td>
<td><strong>No. of cases</strong></td>
<td><strong>Attack Rate per 100 persons</strong></td>
<td><strong>Attack Rate per 100 person weeks</strong></td>
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<tr>
<td>experiencing outbreaks</td>
<td>Patients</td>
<td>169</td>
<td>33</td>
<td>19.5</td>
<td>.81</td>
<td></td>
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<tr>
<td></td>
<td>Staff</td>
<td>260</td>
<td>14</td>
<td>5.4</td>
<td>.17</td>
<td></td>
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<tr>
<td><strong>17 units</strong></td>
<td><strong>not</strong></td>
<td><strong>experiencing</strong></td>
<td><strong>outbreaks</strong></td>
<td><strong>Patients</strong></td>
<td><strong>506</strong></td>
<td><strong>10</strong></td>
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<tr>
<td></td>
<td>staff</td>
<td>698</td>
<td>1</td>
<td>0.1</td>
<td>.01</td>
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Renal bone disease
ALUMINIUM TOXICITY

DEMENTIA

OSTEOMALACIA

MICROCYTIC ANAEMIA
TWIN GIVES KIDNEY TO HIS BROTHER
SURVIVAL OF FIRST CADAVER GRAFTS IN EDINBURGH

<table>
<thead>
<tr>
<th>Years</th>
<th>Nos. at risk at</th>
<th>0</th>
<th>3</th>
<th>6</th>
<th>12</th>
<th>24</th>
<th>36</th>
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<tbody>
<tr>
<td>1978</td>
<td></td>
<td>16</td>
<td>16</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>0</td>
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<tr>
<td>1979</td>
<td></td>
<td>9</td>
<td>9</td>
<td>6</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1980</td>
<td></td>
<td>14</td>
<td>5</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>39</td>
<td>30</td>
<td>15</td>
<td>8</td>
<td>3</td>
<td>0</td>
</tr>
</tbody>
</table>

- Percent Graft Survival vs. Time (Months)
Summary

• Development of 2 life saving treatments
• Renal failure became manageable
• New (& simple) treatments to manage the complication of renal failure (bone disease, anaemia)