have been immunised by this, but not all of them. Some of them make, quickly, strong antibodies against leucocytes, others do not. We do not know the clinical importance of this capacity, but it might be of importance.

A second point which has not been mentioned is that probably the only drug which is really effective in suppressing the homograft sensitivity which (contrary to our earlier thoughts on this point) can be induced by blood transfusion, is probably antilymphocyte serum, and this might in future be one of the main indications for antilymphocyte serum in renal transplantation.

Then a second general point I would like to make is this: from our retrospective studies it is quite clear that the classical forms of immunosuppression, such as prednisone and Imuran, are quite able, even with a mis-matched kidney, to keep a kidney going for 18 months to two years. It is only after that period of time that the mis-matched kidneys do significantly less well than the well-matched ones. I bring up this point because it is of direct relevance to the evaluation of old and new drugs. It is only after you have used your drug for two years or more that you really can start making comparisons.

The Chairman: Thank you, Dr. Van Rood. You will surely know that the Montreal group and some others claim that multiple blood transfusions before grafting may have an exactly opposite effect, that is, improving the results of the transplantation exactly as if they had some enhancement effect.

THE CIMINO-BRESCIA FISTULA

Chairman: Mr. Anthony Walsh, Dublin

The Chairman: The Cimino-Brescia fistula has been claimed by many people to be one of the great advances of recent years in the technique of dialysis. Others say they have tried it and cannot make it work. So we thought it would be a good idea to assemble here on the panel a number of people who among them have a considerable experience of using the Cimino-Brescia fistula, to see if we can find out why some people make it work and some people do not.

I shall start by asking Dr. Hanson to show the ‘classical’ technique of the Cimino-Brescia fistula.

Hanson (Dublin): The normal procedure is to cut down on the cephalic vein some 2-3 inches proximal to the wrist (Fig. 1). There are two important points (1) to make adequate mobilisation of your vessel (2) to keep the opening in your fistula to 5 mm or less. Here you see both the radial artery and cephalic vein dissected, and the orifice, which is about 5 mm.

Figure 2 shows the fistula completed. There is no angulation in either vessel; they come smoothly together. Figure 3 shows the fistula in use.

The Chairman: Thank you. Dr. Hanson’s points are that the fistula should not be more than 5 mm and that one must take care and time to get adequate mobilisation of the vessels so that there is no kinking, particularly of the vein. I think your emphasis is that it must not be kinked by fascia?

Hanson (Dublin): Yes. You must get adequate undermining of the superficial fascia so that the vein swings deep to the superficial fascia. Without adequate undermining of the skin flaps this will not happen and you will get kinking and subsequent clotting in the vein.
Fig 1. Radial artery and cephalic vein dissected free. Each has been incised for 0.5 cm. Vessels are held in position by DeBakey clamps and are ready for anastomosis.

Fig. 2. The fistula completed.
Fig. 3. Needles in position for dialysis.

The Chairman: Would any other member of the panel like to comment on this classical technique and any variation they feel is necessary.

Conte (Toulouse): Jusqu'ici nous n'avons réalisé que des fistules artério-veineuses latéro-latérales. Ce type de fistule semble préférable car la veine de drainage périphérique dilate la presque totalité des veines de l'avant-bras et augmente le capital veineux utilisable pour les ponctions.

Verberckmoes (Louvain): During our first year of experience with the latero-lateral anastomosis the surgeons reported to us that the diameter of the orifice was 1.2–3.5 cm.

Lindstedt (Lund): I should like to point out the importance of the quality of the vein for the anastomosis. I have tried in four cases to use recanalised or thrombectomised veins and all of these have failed. If no other vein is available, you may find that the basilic vein can be anastomosed to the ulnar artery.

Shaldon (London): I think that the size of the fistula in Dr. Cimino's unit in New York is now not more than 3 mm, because of the tendency of the anastomosis to enlarge with time.

The Chairman: A very important point, I think, in the side-to-side anastomosis. There is evidence that in some patients the fistula tends to enlarge with time. This may be a function of the patient's blood pressure control—I do not know—but if the fistula is going to enlarge with time it is important not to start with it too big. If you can get a fistula to work with a small orifice there is no point in making it much larger.

Now some members of the panel have used different techniques such as end-to-end anastomosis. Dr. Válek last year described one very simple method.

Válek (Prague): Two years ago we started with side-to-side anastomosis, but with very bad results. Of 12 fistulas, eight were thrombosed during the first month. Moreover we did not always have surgical help available. Therefore we looked for a simpler method; we found it in the fibrin tunnel technique which was described in Volume 4 of the Proceedings of the E.D.T.A.

The isolated artery is passed through the small fibrin tunnel. The end of the artery is turned back over the edge of the fibrin tunnel and ligated with a fine catgut ligature. Then a suitable
subcutaneous vein is slipped over the end of the tunnel and also ligated. The endothelium is not damaged so that the fistula has a better chance of remaining patent. Within six months the fibrin tunnel will be absorbed so that the anastomosis is made only by the walls of the vessels. The method is relatively quick and easy; my young collaborators are able to undertake the operation in 20 minutes without any help from a vascular surgeon.

To date we have performed 25 fistulas in 24 patients. Only two have failed, one because the fistula was inserted on the venous side and a sharp bend was created. In the other case, during a nephrectomy the arm was bound to the operating table. Our oldest fistula has now been running for 20 months.

The Chairman: Thank you. Would anyone like to comment on other methods of end-to-end anastomosis?

Strangfeld (Berlin): Last year we used termino-terminal anastomosis. We had 20 cases with only 2 thromboses. The mean follow-up for the fistulas is 230 days.

The Chairman: Will the panel members now describe the success rate they are achieving with these fistulas. How many are doing what they are designed to do: to produce large subcutaneous veins that are easily punctured and give an adequate flow for dialysis? Dr. Hanson?

Hanson (Dublin): These are our results from December 1967 to May 1968 (Table 1). Since then 14 other patients have had successful fistulas. Thirty-one patients had immediate success in creation of a fistula; seven had to have repeated fistulas. I must point out that most of these patients had previously had repeated shunt insertions and it was because of repeated clotting and infection that we decided to do arterio-venous fistulas on them. These were difficult patients with, for instance, only one ulnar artery patient.

In two patients we failed to create fistulas. The anastomosis appeared satisfactory but it functioned for a few minutes only and then clotted.

The Chairman: Forty patients, 38 had successful fistulas, 2 repeatedly clotted: Dr. Verberckmoes, what has been your experience?

Verberckmoes (Louvain): We had 47 anastomoses in 40 patients with six immediate thromboses. This left us with 41 functioning fistulas in 37 patients—25 in 23 males and 16 in 14 females. Our follow-up is now 11,500 patient-days and the mean follow-up per fistula is 281 days—336 for male patients, 194 for females, 321 for latero-lateral anastomoses and 229 for termino-terminal anastomoses.

Strangfeld (Berlin): We have now made 26 fistulas, but I must say that the fistula should be made on a virgin arm. We have failed to produce fistulas in patients who had previously
had a shunt which was abandoned because of infection or thrombosis. We tried 6 times without success. I think it is necessary to have good veins when you create a fistula.

The Chairman: In other words, at the start of your experience with fistulas you probably want to work on good arms. But I think Dr. Hanson has shown that with practice you can succeed in producing satisfactory fistulas in patients who have had repeated cannulations for Scribner shunts.

Conte (Toulouse): Actuellement nous avons réalisé 26 fistules et nous avons eu 2 échecs immédiats sous forme de thrombose; notre pourcentage de succès est donc très élevé; nous n'avons cependant choisi que des malades favorables, présentant des veines volumineuses.

Klütsch (Würzburg): In the last two years we have performed 32 fistulas: 5 of them did not run, 4 of which were in females.

Shaldon (London): Mr. Chairman, you seem to have an idée fixe on the arm. I have one patient with a leg fistula, and have found that Dr. Snyder in New York has two or three patients with successfully functioning fistulas in the leg. This is a possibility we ought to consider because of the difficulty in patients who have had multiple cannulations in their arms. Has anyone else on the panel any experience with the leg fistula?

Verberckmoes (Louvain): Just one, with immediate thrombosis.

The Chairman: Anyone in the audience?

Jutzler (Homburg): One leg fistula with satisfactory function for 3 months.

Berk (Chicago): We have two patients out of two with well functioning end-to-side fistulas in the leg. We are using them with an external veno-venal access for dialysis and it is working well.

Meins (Hamburg): We have two fistulas in the leg, one working for eight months and one for two. One has had trouble with clotting.

Snyder (New York): I want to enlarge on what Dr. Shaldon said about our experience. We found that in one patient the saphenous vein did not dilate adequately and, after a venogram, we ligated several of the deep communicating veins. We saw some improvement but the vein was not really adequate for a good dialysis in this patient. Are there any comments from the panel on ligation of communicating veins and ligation of the distal artery?

The Chairman: Before we go on to that point, I will ask Dr. Shaldon to illustrate the use of this fistula in home dialysis. It has been suggested that the fistula would be unsuitable for home dialysis as needling would be too difficult; if it works in the home it should certainly work in hospital.

### TABLE II

Rationale for use of A-V fistula in home haemodialysis.

<table>
<thead>
<tr>
<th>Medical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major problem is the cannula which requires expert medical supervision when it goes wrong</td>
</tr>
<tr>
<td>If A/V fistula can successfully replace the cannula the major obstacle to large scale home dialysis may have been overcome:</td>
</tr>
<tr>
<td>1. Hospitalisation unnecessary</td>
</tr>
<tr>
<td>2. Distance not critical</td>
</tr>
<tr>
<td>3. Blood transfusions not routinely necessary</td>
</tr>
<tr>
<td>4. Efficient commercial servicing eliminates technical problems</td>
</tr>
</tbody>
</table>
ROUND TABLE DISCUSSION

Fig. 4. Wife needling husband.

Shaldon (London): My interest in the fistula (Table II) stemmed not from difficulty with the shunt, but from an appreciation of the problems which it ultimately entails. I was interested in using it in the home with a Kiil, which is not the conventional technique at the moment, and if our preliminary experience can be substantiated it will be a major advance in avoiding the medical problems associated with external cannulas.

Our experience to date consists of 5 patients, 4 male and 1 female; the sex is important because women tend to have smaller vessels and smaller limbs which makes them more difficult for the layman to puncture. Four fistulas are in the arm and one in the leg. There is a 30 month total experience; all these patients are dialysing at least three times a week and do not experience any healing problems in spite of this frequency of puncture. The longest patient is 11 months in the home with a fistula.

We have used modified teflon catheters for needling but have found them less successful than thin-walled stainless steel needles. Figure 4 shows a wife inserting needles into her husband's arm vein. A 17-year-old boy inserts the needles into his own arm. His only requirement is for someone to hold the skin back while he does this; there seems to be no difficulty once the patient has overcome the initial anxiety.

I should stress that all these patients wanted fistulas and this patient wanted to put his own needles in; no patient has been forced to undergo this procedure.

There are extra monitoring requirements because these dialyses are done overnight in the home and a blood pump has to be used. By monitoring the pressure in the blood tubing leaving the patient before the blood pump the major risk of an air embolus is overcome to my satisfaction and I do not feel that we are being irresponsible. The advantage of using a blood pump is that the resistance to blood flow in the dialyser becomes less significant, and one can use a higher-resistance parallel flow dialyser.

This simple monitoring device is just a collapsible segment in the outflow blood line which, when it collapses, triggers a microswitch which sounds an alarm and arrests the blood pump.

TABLE III

Results with A/V fistula

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. No evidence of cardiac side effects. Cardiac output not significantly increased. (Fistula size 0.3-0.5 cm)</td>
<td></td>
</tr>
<tr>
<td>2. No increase in free plasma Hb after pumped needle Kiil dialysis</td>
<td></td>
</tr>
<tr>
<td>3. No patient has required transfusion. P.C.V. either rising or static</td>
<td></td>
</tr>
<tr>
<td>4. Small molecule nitrogen clearance 10%, more efficient than on passive flow Kiil system</td>
<td></td>
</tr>
</tbody>
</table>

396
Our results are summarised in Table III; our follow-up is not long enough to be dogmatic, but we have not seen any significant alteration in the haemodynamic state of the patients. There does not seem to be any important haemolysis, but the flow rates we use are considerably less than on the coil. There have been no transfusion requirements. The clearance rates have been slightly better than with the shunt because the blood flow rates have been somewhat higher with the aid of a pump.

The benefits to the patient are both psychological and physical. Their greater freedom in exercise is illustrated in Figures 5 and 6, particularly their ability to enter water without inhibition.
ROUND TABLE DISCUSSION

The problem that concerns me most is the development of needling techniques, because of the difficulty that lay people have initially. We have not had reported to us any increase in the frequency of alarms at night with the use of a blood pump and stainless steel needles, compared with a pumpless system. It seems that, provided the limb is held reasonably still, these patients do not have to be constantly adjusting the needles.

The CHAIRMAN: Any comments from the panel or the audience?

Fosso (Oslo): I have no comment on this, but I would like to show a slide of a shunt on the leg which we made six months ago. To make puncture easier we constructed a skin tube around the saphenous vein in two places and we can needle these sites three times a week with no healing problems. I think that this fistula should be so easy to cannulate that the patient could do it at home. It is also possible to put an electromagnetic blood flow meter on the skin tube. We found a blood flow of 500 ml per minute and have not seen any reduction in flow with time.

The CHAIRMAN: Thank you for this very ingenious idea. Now we must move on; Dr. Conte has reported cardiovascular problems in patients with fistulas; his data have already been published in full, but I shall ask him to summarise his findings.

Conte (Toulouse): Pour répondre brièvement à cette question importante, nous avons confronté les données cliniques, radiologiques, électrocardiographiques et hémodynamiques recueillies chez nos malades.

<table>
<thead>
<tr>
<th>Nom</th>
<th>Nombre de jours</th>
<th>Volume sanguin (l)</th>
<th>Volume sanguin (l/m²)</th>
<th>Débit cardiaque (l/mn)</th>
<th>Fréquence cardiaque (mn)</th>
<th>Volume systolique (ml/mn)</th>
<th>Index cardiaque (l/mn/m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Rod</td>
<td>15</td>
<td>4,75</td>
<td>(3,07)</td>
<td>6,4</td>
<td>85</td>
<td>75</td>
<td>4,1</td>
</tr>
<tr>
<td>6 Gra</td>
<td>66</td>
<td>6,25</td>
<td>(3,55)</td>
<td>10,0</td>
<td>90</td>
<td>111</td>
<td>5,7</td>
</tr>
<tr>
<td>7 Esc</td>
<td>72</td>
<td>4,70</td>
<td>(3)</td>
<td>11,3</td>
<td>110</td>
<td>102</td>
<td>7,2</td>
</tr>
<tr>
<td>9 Ram</td>
<td>115</td>
<td>6,20</td>
<td>(3,5)</td>
<td>9,9</td>
<td>80</td>
<td>124</td>
<td>5,7</td>
</tr>
<tr>
<td>12 Sai</td>
<td>230</td>
<td>6,40</td>
<td>(3,6)</td>
<td>9,6</td>
<td>90</td>
<td>107</td>
<td>5,5</td>
</tr>
<tr>
<td>13 Bou</td>
<td>280</td>
<td>4,35</td>
<td>(2,8)</td>
<td>6,6</td>
<td>70</td>
<td>94</td>
<td>4,2</td>
</tr>
<tr>
<td>14 Gar</td>
<td>391</td>
<td>3,20</td>
<td>(2,1)</td>
<td>6,4</td>
<td>85</td>
<td>75</td>
<td>4,1</td>
</tr>
<tr>
<td>Valeur moyenne</td>
<td></td>
<td>8,6</td>
<td></td>
<td>(+ 56,5%)</td>
<td>(+ 58%)</td>
<td>(+ 62,5%)</td>
<td></td>
</tr>
</tbody>
</table>

La fistule artério-veineuse entraîne surtout des conséquences hémodynamiques centrales qui portent sur le débit cardiaque et les pressions intracardiaques. Tous nos malades (Tableau IV) présentaient une augmentation très significative du débit cardiaque (8,61 en moyenne, soit +56,5%) et de l’index cardiaque (5,21/ml/m² en moyenne, soit +62,5%). Mais il s’agit d’un type de malade très particulier puisqu’ils sont ‘urémiques’, souvent hypertendus et avec un hématocrite bas. Afin de préciser la responsabilité de la fistule artério-veineuse dans l’augmentation du débit cardiaque, nous avons comparé le débit cardiaque avant et après compression de la fistule artério-veineuse. La compression de la fistule artério-veineuse entraîne une diminution significative du débit cardiaque et de l’index cardiaque de —18,7% (Tableau V). Cette différence très importante a été notée chez tous nos malades hypertendus ou non; elle est retrouvée par Menno. C’est un indice approximatif du volume du shunt; il suggère le rôle important de la fistule dans l’augmentation du débit cardiaque.
TABLEAU V
Variation du débit cardiaque, de l'index cardiaque et du volume systolique après compression de la fistule artério-veineuse

<table>
<thead>
<tr>
<th></th>
<th>Volume sanguin l/ mn</th>
<th>Fréquence cardiaque</th>
<th>Débit cardiaque l/ mn</th>
<th>Volume systolique l/ mn</th>
<th>Index cardiaque l/ mn</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Avant compression</td>
<td>Après compression</td>
<td>Avant compression</td>
<td>Après compression</td>
<td>Avant compression</td>
</tr>
<tr>
<td>7 Esc</td>
<td>72</td>
<td>4,7</td>
<td>110</td>
<td>100</td>
<td>11,3</td>
</tr>
<tr>
<td>8 Gom</td>
<td>88</td>
<td>5,2</td>
<td>90</td>
<td>85</td>
<td>6,5</td>
</tr>
<tr>
<td>9 Ram</td>
<td>115</td>
<td>6,2</td>
<td>80</td>
<td>75</td>
<td>9,9</td>
</tr>
<tr>
<td>13 Bou</td>
<td>280</td>
<td>4,35</td>
<td>70</td>
<td>70</td>
<td>6,6</td>
</tr>
<tr>
<td>Variation moyenne</td>
<td>-5%</td>
<td>-18,7%</td>
<td>-14%</td>
<td>-28,6%</td>
<td></td>
</tr>
</tbody>
</table>
En ce qui concerne les pressions intracardiaques droites, la pression systolique intraventriculaire droite est augmentée mais sans variation de la pression diastolique (Tableau VI); il ne s'agit donc pas d'une insuffisance cardiaque.

<table>
<thead>
<tr>
<th>Groupe</th>
<th>Nom</th>
<th>Durée</th>
<th>Pm mm Hg Veine cave supérieure</th>
<th>Pm mm Hg Oreillette droite</th>
<th>Ventricule droit</th>
<th>P systolique</th>
</tr>
</thead>
<tbody>
<tr>
<td>Groupe A</td>
<td>6 Gra</td>
<td>66</td>
<td>4</td>
<td>4,5</td>
<td>1</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>9 Ram</td>
<td>115</td>
<td>2</td>
<td>2,5</td>
<td>0</td>
<td>26</td>
</tr>
<tr>
<td>Groupe B</td>
<td>7 Esc</td>
<td>72</td>
<td>4</td>
<td>4</td>
<td>1</td>
<td>41</td>
</tr>
<tr>
<td></td>
<td>12 Sai</td>
<td>230</td>
<td>7,5</td>
<td>7,5</td>
<td>5</td>
<td>37</td>
</tr>
<tr>
<td></td>
<td>13 Bou</td>
<td>280</td>
<td>5,5</td>
<td>6,5</td>
<td>3</td>
<td>36</td>
</tr>
<tr>
<td></td>
<td>14 Gar</td>
<td>391</td>
<td>8</td>
<td>9</td>
<td>4</td>
<td>42</td>
</tr>
<tr>
<td>Groupe C</td>
<td>8 Gom 1</td>
<td>88</td>
<td>12,5</td>
<td>12,5</td>
<td>5</td>
<td>44</td>
</tr>
<tr>
<td></td>
<td>8 Gom 2</td>
<td>205</td>
<td>5</td>
<td>5</td>
<td>1</td>
<td>42</td>
</tr>
</tbody>
</table>

Fig. 7. Courbe de pression ventriculaire droite. Aspect caractéristique d’un hyperlfoit ventriculaire.

Nous avons été frappés par la forme particulière des courbes de pression intraventriculaire droite qui ont toutes un aspect pointu, c'est-à-dire un aspect caractéristique d'un hyperlfoit ventriculaire lié dans le cas des fistules à l'augmentation du retour veineux droit (Fig. 7).

Les résistances systémiques augmentent lors de la compression de la fistule artério-veineuse.

En définitive ces données permettent de dire qu'il existe une adaptation hémodynamique indiscutable lors de la création d'une fistule artério-veineuse chirurgicale: les fistules artério-veineuses chirurgicales ont un retentissement cardiaque mais nous ne savons pas combien de temps cette adaptation sera tolérée.
The Chairman: We must clearly distinguish two problems here. First, are there measurable changes in cardiac output? Secondly, if so, are these of any clinical importance? Dr. Verberckmoes?

Verberckmoes (Louvain): Dr. Conte's observations are in contrast with what we reported last year in Paris; we found no significant influence on cardiac output. This year we repeated the studies in 5 male patients who were judged clinically to have the largest fistulas. On closing the fistula there was a maximum decrease of 18% in one patient with a mean of 12%. We carried out the same studies after 200 kcal of exercise in 5-7 minutes and the change in cardiac output on compression of the fistula was of the same order.

I doubt if this increase in cardiac output, not exceeding 20%, as a result of the fistula is a significant burden on the heart and so far we have not encountered any clinical problems.

Shaldon (London): If you look back at the Transactions of the ASAIO for 1961 (Volume 7, p. 65, Ed.) you will find a similar discussion of the effects of the external shunt on cardiac output when doubts were expressed about the ultimate strain that this might have on the circulation.

Klütsch (Würzburg): We have measured cardiac output before and after occlusion and seen differences of, at the most, 10%. In this acute experiment the change is not very significant. We have rechecked cardiac output two years after insertion of the fistula; in two instances it had increased by 1 and 1.5 litres respectively. I do not venture to say that this was due to the fistula since there are so many other factors such as haemodilution which might be responsible.

Strangfeld (Berlin): We have measured cardiac output in 10 patients over 6 to 16 months. Cardiac output in uraemic patients is raised to 7-9 litres per minute. After the fistula is inserted there is little change. Sometimes there was an increase in cardiac output but this was at a time when the patient was overhydrated and at a later stage the cardiac output can be seen reverting to the pre-fistula level.

We have always used the side-to-side anastomosis with a maximum orifice of 5 mm. The patients had haematocrits of 27 to 35%.

The Chairman: I think this last point is important. If people are reporting any problems with the fistula in the future, they should specify the type of fistula, the size as far as it is known, whether it has obviously enlarged, the haematocrit and, particularly, the blood pressure control. Obviously the significance of a change might be very different in a normotensive patient and in one with totally inadequate blood pressure control.

Perhaps we might get some help here from Dr. Lindstedt, who has an experience of some 60 fistulas, not all of which were made in patients with renal failure.

Lindstedt (Lund): We were testing a new substance for the treatment of prostatic carcinoma, a combination of a cytostatic drug and an oestrogen, which must be given intravenously. We found that it gave rise to thrombophlebitis and therefore we started using the Cimino-Brescia fistula in these patients. Since then we have had thrombophlebitis in only two cases after more than 700 injections. We have also used the fistula for other intravenous therapy and for taking blood samples after major surgical operations, especially in patients with carcinoma or other lesions of the gastrointestinal tract where it was foreseen that intravenous therapy would be necessary over a long period. In 4 female patients intravenous therapy was practically impossible before we made the fistula.

The success rate in establishing a functioning fistula was not as high in the patients who were not uraemic as in those who had uraemia and attendant changes in blood clotting. In
ROUND TABLE DISCUSSION

29 uraemic patients it has been possible to get a functioning fistula with 31 operations, but in some of the other patients it has been impossible to establish a fistula even with several operations (Table VII).

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
<th>Functioning</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>For haemodialysis</td>
<td>14</td>
<td>15</td>
<td>29</td>
<td>29</td>
</tr>
<tr>
<td>For injection of cytostatics</td>
<td>26</td>
<td>0</td>
<td>22</td>
<td>26</td>
</tr>
<tr>
<td>For intravenous therapy</td>
<td>7</td>
<td>4</td>
<td>8</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>47</td>
<td>19</td>
<td>59</td>
<td>66</td>
</tr>
</tbody>
</table>

The Chairman: I will try to summarise what we have so far. All members of the panel agree that these fistulas can be made with a high success rate. Most panel members think that cardiac complications should be few and far between. Dr. Lindstedt has pointed out some other uses of the fistula and Dr. Shaldon has just whispered to me that it might be useful in a patient with aplastic anaemia requiring repeated transfusions—obviously very much preferable to a conventional shunt.

All panelists who have seen a large number of fistulas, and have also had experience with external cannulae, are quite satisfied that the vast majority of patients enormously prefer a fistula.

I will now throw the discussion open to questions from the hall.

Unidentified Member: With A-V fistulas we have twice found aneurysm formation; what is the experience of others? The other interesting thing is that most of the fistulas closed within a few days of successful transplantation.

The Chairman: We have also seen 4 or 5 fistulas close within a few months of transplantation. This may be due to the increased viscosity of the blood after transplant, when the anaemia has been corrected.

The other point, about aneurysm, is an important one and I shall ask Dr. Verberckmoes who has a long experience of fistulas to comment on both these points.

Verberckmoes (Louvain): At Louvain we had three patients in whom aneurysm developed, in one case an infected aneurysm which had to be removed. In a second patient the aneurysm was too large and was also removed; in the same patient the second fistula developed a small aneurysm but it can still be used at the moment. A fourth patient had a small aneurysm.

Lindstedt (Lund): I should like to stress the importance of the changes in the coagulation mechanism in the uraemic patients, many of whom have increased bleeding time, decreased platelet adhesiveness, increased fibrinogen, increased antihaemophilic factor and an increase in inhibitors of fibrinolysis activators as has been shown by Larsson, Hedner and Nilsson (1968). Some of those changes become normalised after a successful transplantation (Bergentz, 1968). We have also seen a fistula close after a successful transplant.

O’Sullivan (Cork): Has any member of the panel succeeded in running a patient on a Kiil dialyser without a pump, using a fistula? I have succeeded in doing this in two patients by anastomosing the basilic vein subcutaneously to the radial artery, giving a high pressure system on the medial side of the arm and a low pressure system on the lateral side.
THE CIMINO-BRESCIA FISTULA

SHALDON (London): The only problem here is that your venous return is in a non-fistularised system and eventually you will lose access to that system.

MICHELSSEN (Louvain): Why do so many panel members emphasise the size of the fistula? There seems to be no difference between the end-to-side and side-to-side fistulas and the cardiac complications were more important with the small fistulas of Dr. Conte than with the large fistulas of Dr. Verberckmoes.

CONTE (Toulouse): Le diamètre des fistules latéro-latérales est de 3 à 5 mm, mais il faut noter que tous nos malades sont hypertendus, et c'est la raison pour laquelle nous avons trouvé des différences dans le débit cardiaque lorsque la fistule est ouverte ou fermée.

The Chairman: Dr. Conte has made this critical point; the patients he was talking about were hypertensive. Dr. Verberckmoes?

VERBERCKMOES (Louvain): I do not think the difference in orifice between 5 mm and 15 mm is critical in determining the resistance to blood flow through the fistula. The calibre of the artery may be more important.

DROKKER (Amsterdam): Could the panel members comment on the type of needle to be preferred? We have had several clotting episodes in our needles.

HANSON (Dublin): Our big problem was not creating the fistulas but getting suitable needles. We find thin-walled, finely-polished steel needles the best.

SHALDON (London): It is not just the needles but the technique of insertion as well, and the time that unheparinised blood is in contact with the inside of the needle. The needle should be kept full of heparinised saline. Since we have been doing that, without siliconisation, we have had no clotting problems; previously we got a fibrin plug in the needle which built up during dialysis.

VERBERCKMOES (Louvain): We use polypropylene needles and have never had problems with coagulation in the needle.

CLARK (Edinburgh): Have panel members any experience of restoring the flow in a clotted fistula? We have attempted this in one patient without success.

LINDSTEDT (Lund): We had a secondary closure of one fistula in a uraemic patient five months after construction when she had an acute abdominal disease with shock. We did a thrombectomy 3 days later and restored the flow but the fistula clotted again one week later. After a new operation involving resection of both artery and vein we were able to make a new end-to-side anastomosis, and the fistula functioned for another five months, until the patient died.

LEONARDS (Cleveland): Dr. Shaldon alluded to the problem of air embolism. We have had two. What is the experience of the rest of the panel and how do they avoid it?

The Chairman: We seem to have no further comment on this point. Perhaps the panel have been lucky in this regard!
ROUND TABLE DISCUSSION

SHALDON (London): An additional monitor can be fixed on the venous bubble trap. A device under development which is based on the weight of the bubble trap will, I think, prove the most suitable. However I think you can over-monitor the system. As long as you are monitoring the pressure upstream of the pump and this controls the pump, I do not see how you can get an air embolus—but I could be wrong!

MEYEROVIC (Paris): We had experience of 26 fistulas. Clotting sometimes occurred early—in the first few hours or days. We had two successes in declotting by inserting a small catheter into the vein and flushing it with a constant infusion of streptokinase.

I have a question about infection of fistulas. We had a patient who received a heavily contaminated unit of blood and developed septicemia which was cured; six months later the blood flow in the fistula suddenly increased, without fever or any other sign of sepsis. We removed the fistula because of heart failure and found bacterial contamination inside the fistula, the equivalent of an Osler's endocarditis. Has any panel member any experience of infection without direct introduction and with a sudden increase in blood flow as the only manifestation?

CONTÉ (Toulouse): Chez un de nos malades décédé d'une septicémie à pyocyanique la fistule artério-veineuse donnait une culture pure et abondante de pyocyanique.

The CHAIRMAN: Time is up. I thank all the panellists and I think it is fair to summarise by saying that we are all agreed that the fistula is a notable advance in dialysis technique.

DISTURBANCES OF CALCIUM METABOLISM IN TRANSPLANTED PATIENTS AND PATIENTS ON MAINTENANCE HAEMODIALYSIS

Chairman: Dr. A. R. HARRISON, London

The CHAIRMAN: This is a very large, fascinating and mysterious subject which we cannot possibly deal with completely. We are going to discuss two topics: the influence of regular dialysis on calcium and bone metabolism and the problems created by the development of autonomous (or tertiary) hyperparathyroidism in patients who have undergone successful renal homotransplantation.

To turn to the first of these topics, Dr. Curtis has already described findings indicating that regular dialysis can have a beneficial effect on these metabolic disturbances, but some members of this panel may have evidence which points in a different direction. I shall start by asking Dr. Kaye and then Dr. Schorr to discuss their experiences of these problems.

KAYE (Montreal): For the purpose of this presentation we reviewed the clinical, radiological and histological data from 28 patients on our programme. X-rays were available from all, and there were 24 bone biopsies in 20 patients. I shall confine my remarks to hyperparathyroidism.

None of these patients had symptomatic bone disease; none had fractures; none had bone pain. The majority of patients have histological evidence of osteitis fibrosa by the time they start dialysis. This agrees with the findings of Berson and Yalow who showed that the plasma