Effect of Arteriovenous Fistula Creation and Maturation on Rest Hemodynamics in Patients with End-Stage Renal Disease

M.	Miroslav	Munclinger
K.	Karel	Němeček
B.	Boris	Šerf
V.	Vladimir	Vondráček
J.	Jana	Hrudová

2nd Department of Internal Medicine, Faculty of Medicine, Charles University, Prague, Czechoslovakia

Miroslav Munclinger, MD., 2nd Department of Internal Medicine, Faculty of Medicine, Charles University, U nemocnice 2, 128 08 Prague 2, (Czechoslovakia)

Dear Sir,

Arteriovenous (A-V) fistulae established in patients with end-stage renal disease for regular hemodialysis are presumed to impose an increased load upon the heart. Considerable decrease of cardiac output was observed after acute occlusion of A-V fistulae [1, 2]. This approach does not reflect long-term circulatory adaptation to fistulae. Therefore, we compared the hemodynamics at rest before fistula creation and after its maturation, 2 months later.

before surgical creation of an A-V fistula and 66.4 ± 15.9 days following the operation, e.g. in the time when the functioning fistula has matured. Forearm fistulae were constructed in all patients (in 7 Cimino, in 2 with autogenous saphenous vein grafts and in 1 using a prosthetic graft). Five patients (No. 1,2,3, 5 and 7) were hemodialyzed twice a week up until the time of the second examination. In dialyzed patients, echocardiography was performed 12–14 h after hemodialysis and cardiac catheterization was done 30–32 h following the end of dialysis, e.g. in the half-time between the hemodialyses. Wilcoxon's nonparametric test for paired values was used for evaluation.

Results and Discussion

Methods

Ten patients with end-stage renal disease were explored by M-mode echocardiography and in 7 of them right-heart catheterization was performed as well. The examinations were done a few days

There were significant differences neither between the echocardiographic parameters nor between the hemodynamic parameters obtained before fistula creation and after its maturation, 66.4 ± 15.9 days following the operation (table I).

Table I. Some hemodynamic data before (pre) fistula creation and after (post) fistula maturation

Patient

HR

Pra

Pba

CI

SVR

LVMWI

No.
beat/min
mmHg

mmHg

l/min,
/m²
(U) pre
post
kg · m/m
pre
2

pre
post
pre
post
pre
post
pre
post

post
1
63
79
2.5
4.0
115

120
5.4
4.7
11.3
13.2
8.4
7.6
2
77
76
3.5
7.5
110
145
2.3
4.4
27.6
18.2
3.4
8.3
3
62
72
3.5
2.0
124
93
5.7
2.6
10.5
18.1
9.5
3.3
5
78
78
3.5
2.5
100
98
3.7
3.9
15.5
14.3
4.9
5.2

6
74
81
1.5
4.0
100
-
2.4
2.4
25.5
-
3.3
-
7
96
74
2.0
3.5
88
88
4.3
3.6
10.1
11.7
5.1
4.3
9
77
60
5.5
4.0
145
104
3.8
3.5
21.0
22.6
7.4
5.0
P
NS

NS

NS

NS

NS

NS

HR=Heart rate; PRA=right atrium mean pressure; PBA=brachial artery mean pressure; CI=cardiac index; SVR=systemic vascular resistance; U=units; LVMWI=left ventricle minute work index; p=statistical significance; NS=not significant.

106

Mundlinger/Němecek/Serf/Vondráček/Hrudová

According to our experience, neither cardiac output nor cardiac load are necessarily increased by a mature forearm A-V fistula in patients with end-stage renal disease. The decrease of vascular resistance in the A-V fistula and its vicinity is probably counterbalanced through the increase in other parts of systemic circulation. Thus, the existence of a mature A-V fistula per se should not be taken for a significant hemodynamic burden. This does not apply to pathologically dilated fistulae with high blood flow [3].

References

1 Johnson, J.F., Jr.; Blythe, W.B.: Hemodynamic effects of arteriovenous shunts used for hemodialysis. *Ann. Surg.* 77:715–723 (1970).

Dongradi, G.; Rocha, P.; Baron, B.; Khazine, F.; Simons, O.; Kahn, J.C.; Fendler, J.P.: Hemodynamic effects of arteriovenous fistulae in chronic hemodialysis patients at rest and during exercise. *Clin. Nephrol.* 75:75–79 (1981).

Ahearn, D.J.; Maher, J.F.: Heart failure as a complication of hemodialysis arteriovenous fistula. *Ann. intern. Med.* 77: 201–204 (1972).