

The Advantages of End-to-Side Arteriovenous Anastomosis over the Other Two Types of Arteriovenous Anastomosis in Dialysis Patients

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ABSTRACT

The functional duration of vascular access in dialysis patients depends on the emergence of threatening complications. Discussions are constantly being held in an attempt to discover their causality and decrease their emergence. In 260 patients undergoing haemodialysis, we have studied the potential existence of a cause-and-effect relation between the emergence of complications in the vascular access and the applied type of arteriovenous (av.) anastomosis in the arteriovenous (AV) fistula. We have observed the incidence of all complications, both that of the thrombosis incidence as well as the primary and secondary fistula patency (survival). The complications – The examinees with the end-to-end anastomosis showed the incidence of 8.08%, 6.15% of the patients with the end-to-side anastomosis and 7.31% of the patients with the side-to-side anastomosis. The differences regarding incidences are statistically significant (χ^2 -test = 29.25; $P=0.0001$). Thrombosis – it has been found that thrombosis was the most frequent complication developing in 30.00% patients with the end-to-end av. anastomosis, in 2.31% patients with end-to-side av. anastomosis and in 5.56% patients with side-to-side av. anastomosis. The difference between the highest and the lowest assessment is 27.69%, and it is statistically relevant (χ^2 -test = 33.920; $P=0.0001$). The »primary patency« (primary survival): within a 6-month interval following the establishment of vascular access, the first complications arose in 62.50% of patients with end-to-end av. anastomosis, 10.76% in those with end-to-side av. anastomosis and 18.88% in those with side-to-side av. anastomosis. The difference between the highest and the lowest assessment is 51.74%, which is statistically significant (χ^2 -test = 49.009; $P=0.0001$). The secondary patency: 24 months subsequent to the establishment of vascular access, the AV-fistula was still functional in 52.50% of the patients with end-to-end av. anastomosis, 89.23% in those with end-to-side av. anastomosis and 81.11% in those with side-to-side av. anastomosis. The difference between the highest and the lowest assessment is 36.73%, which is also statistically significant (χ^2 -test = 26.579; $P=0.0001$). According to our research, the end-to-side type of av. anastomosis in vascular access provides better results both in relation to the duration as well as the maintenance of the functionality of the Av-fistula and in the lower incidence of the complications than the other types, and hence it shows a definite advantage.

Key words: hemodialysis, vascular access, AV-fistula, av. anastomosis, complications

Introduction

In light of the recent interpretations of human rights and the nation right to a healthier life and medical treatment, patients with an end-stage renal disease are receiving more and more intense care, not only from the medical profession, but from the entire society as has already been emphasised by other authors¹⁻⁴. The initial curing of patients with uremia via dialysis dates back to the 40s of the previous century⁵. Schwab⁴ claims that the

basic principles and methodology have not changed significantly since that time, despite constant research in order to discover new modalities in the technical implementation of haemodialysis. This is related to the synthetic means used for the filtration of extracted blood in dialysis patients, as well as to the structure and the shape of the vascular access.

Vascular access in dialysis patients, with three types at our disposal, still represents the greatest problem for patients, as well as for the teams dealing with haemodialysis. Even to this day, all three vascular approaches, the AV-fistula, the AV-graft and the central venous catheter are not of life-long duration after their establishment, so research is still carried out in order to establish means to prolong their functionality. They have been burdened with threatening complications such as thrombosis, infections, aneurismatic expansion, monomelic neuropathy, and the »steal syndrome«⁶⁻⁸ Recently it has been widely accepted that the lifetime of the AV-fistula in dialysis patients is longer than the AV-graft, hence that type of vascular access is considered as the access of choice⁵ despite the graft still being widely used in the American dialysis centres today^{9,10}. For the emergence of complications and short lifetime of the established vascular access, the pathological changes in the wall of the peripheral vascular pool vessels, especially in diabetic patients, elderly and female adipose individuals are frequently perceived as a cause¹¹.

Recently it has been specifically emphasised that the preoperative vascular mapping should be carried out on the patients in the pre-end-stage of renal disease, in order to determine their suitability and accessibility for the implementation of the vascular access^{3,12,13}. This has contributed to the decrease of complications and prolonging of the functionality of the established access, in addition to the rationalisation of the decision regarding the choice of location for its establishment. The peripheral vascular net is not inexhaustible in offering of the possible choices for establishing the vascular access. Therefore, discussions on how to anticipate the emergence of threatening complications and how to sanitize complications that have already emerged are still being held.

Many instances regarding the vascular access and its deterioration have been examined and discussed in scientific circles^{14,15}. There are also indications, which still needs to be examined, regarding the possibility that even the calcium level in dialysis patients can play a part in emergence of complications¹⁶. In order to examine the matter further the question has been asked whether there is cause-and-effect relationship between the type of applied vascular anastomosis and the emergence of complications, which would be related to the vascular access.

Fillinger et al.¹⁷ have already raised the question of whether the anastomosis of the Brescia-Cimino type¹⁸ in the fistula of dialysis patients has an influence on the prolongation of vascular access lifetime. Raheb and associates¹⁹ have indicated at the specific relation between the incidence of the emergence of the complications and the type of arteriovenous anastomosis in the AV-fistula. This becomes apparent from their recommendation in the case of venous stenosis with consecutive thrombosis, where they recommend applying surgical therapy on the emerged complication, and then to convert the established end-to-side anastomosis to an end-to-end type. Krueger and associates²⁰ have again noticed a more frequent emergence of the intimal hyperplasia on the ve-

nous anastomosis in the fistula with the causal occlusion of the lumen on those dialysis patients who had had the end-to-side type of anastomosis applied to. The same has not been observed through the application of the other two types of anastomosis.

Zarin et al.²¹ took into consideration the relationship between the type of vascular anastomosis and early complications of the established vascular access. They have found that the frequency of early complications is lesser in dialysis patients with established side-to-side arteriovenous anastomosis than in those with end-to-side arteriovenous anastomosis. Although they have not stated the level of statistical significance of such differences in their publication, they touched upon an open problem for future research.

The problem regarding the correlation of the complication incidence connected to the vascular access and the established type of the arteriovenous anastomosis in dialysis patients is neither sufficiently studied nor defined. In order to contribute to the enlightening of such relation, an effort has been made through the analysis of our clinical material, to continue where a few of the aforementioned authors have stopped.

Materials and Methods

260 patients with an end-stage renal disease who underwent the haemodialysis treatment in the Clinical Hospital Mostar were chosen for analysis. For this purpose, the patients selected were those on whom the vascular access of the upper limbs had been established. All the patients were randomly chosen for observation purposes, and only those in whom the AV-fistula was established. The follow-up was 24 months following the establishment of vascular access and started haemodialysis. Out of 260 examinees, 150 were male and 110 female, aged between 17 and 90 (Table 1).

The illnesses that caused end-stage renal disease are illustrated in Table 2. It can be seen that the diabetes was the cause of the kidney failure in the majority of pa-

TABLE 1
DISTRIBUTION OF EXAMINEES ACCORDING TO SEX AND AGE

Age (years)	Sex		Total
	Male	Female	
to 10–20	1	0	1
21–30	5	1	6
31–40	12	8	20
41–50	35	30	65
51–60	53	42	95
61–70	12	8	20
71–80	24	20	44
81–90	8	1	9
> 90	–	–	–
Total	150 (57.69%)	110 (42.31%)	260 (100%)

TABLE 2
PATHOLOGICAL CONDITIONS THAT CAUSED THE END-STAGE RENAL DISEASE

Primary cause of the end-stage renal disease	N-patients
Primary glomerular disease	40
Diabetic nephropathy	108
Pyelonephritis	41
Polycystic kidney disease	27
Vesicoureteric reflux	13
TBC – renum	6
Alport syndrome	2
Lupus erythemotodes	6
Other and unknown	17
Total	260 (100%)

tients, and Table 3 shows the incidence of comorbid conditions.

In Table 4 it can be seen that the first haemodialysis was carried out in 70 patients (26.92%) out of 260 observed patients through the central venous catheter and not through the AV-fistula. That means that those in whom patients the fistula was established ad hoc, i.e. at the moment of complete kidney failure. It also means that during the preterminal end-stage renal disease, neither the vascular mapping was performed, nor was the state of peripheral blood vessels' wall assessed.

In the statistical analysis, the χ^2 -test was applied.

Results

Table 5 shows types and incidence of threatening complications in all 260 examinees. The picture shows that complications emerged in a significantly smaller number of patients with the end-to-end anastomosis type than in the groups with other two types. Differences are significant (χ^2 -test = 29.25; P=0.0001). The most frequent complication was thrombosis, and the second most frequent complication was systematic and local infection. The number of thrombosis in all observed patients was placed in juxtaposition to the applied type of arteriovenous anastomosis in the AV-fistula.

TABLE 3
INCIDENCE OF COMORBID CONDITIONS

Comorbid conditions	N-patients
Cardiomyopathia	85
Vasculitis	8
Hyperthyreosis	8
Anaemia	22
Carcinoma	115
Other and unknown	22
Total	260

TABLE 4
RELATION BETWEEN THE AV-FISTULA AND THE CENTRAL VENOUS CATHETER

Vascular access type	N-patients	%
AV-fistula	260	100
AV-graft	–	–
Central venous catheter	70	26.92

The time of »primary patency« (primary survival) of the AV-fistula was determined, that is, the time from the establishment of the vascular access till the emergence of the first threatening complications, which at that time, were successfully eliminated and cured, and haemodialysis successfully continued through the same vascular access. Taking the same course of action, we have been determining the time of the »secondary patency« (secondary survival) of the AV-fistula in the manner that we have monitored the number of patients in whom the AV-fistula was still clearly functional after 24 months of the establishment of the vascular access. The primary and secondary time of patency was then put in correlation with the type of applied vascular anastomosis in the AV-fistula.

The incidence of the complications on all 260 examinees is shown in Table 5. It can be seen that thrombosis occurred on 20 (7.69%) examinees. Table 6 illustrates the relation between the incidence of thrombosis and the type of applied arteriovenous anastomosis in the AV-fistula. Therefore, can be seen that thrombosis occurred on 12 (30.0%) out of 20 patients with end-to-end av. anasto-

TABLE 5
TYPES AND FREQUENCY OF THE EMERGENCE OF COMPLICATIONS IN ALL 260 PATIENTS

Vascular access	Complications rate: type and number						Total
	Infections	Thrombosis	»Steal syndrome«	Aneurysm	Haemorrhage	Monomelic neuropathy	
End-to-end	2	12	3	2	1	1	21 (8.08%)
End-to-side	8	3	0	2	1	2	16 (6.15%)
Side-to-side	5	5	2	2	3	2	19 (7.31%)
Total	15 (5.77%)	20 (7.69%)	5 (1.92%)	6 (2.31%)	5 (1.92%)	5 (1.92%)	56 (21.54%)

TABLE 6
CORRELATION BETWEEN THE TYPE OF VASCULAR ANASTOMOSIS IN THE AV-FISTULA AND THE FREQUENCY OF THROMBOSIS

Vascular anastomosis type	Thrombosis		Number of anastomosis
	Yes	No	
End-to-end	12 (30.00%)	28 (70.00%)	40 (15.38%)
End-to-side	3 (2.31%)	127 (97.69%)	130 (50%)
Side-to-side	5 (5.56%)	85 (94.44%)	90 (34.62%)
Total	20 (7.69%)	240 (92.31%)	260 (100%)

TABLE 7
CORRELATION OF VASCULAR ANASTOMOSIS TYPE AND THE »PRIMARY PATENCY« (PRIMARY SURVIVAL) OF AV-FISTULA

Fistula life-time	Vascular anastomosis type			Total
	End-to-end	End-to-side	Side-to-side	
»Primary patency« (Fistula life-time) <6 months	25 (62.50%)	14 (10.76%)	17 (18.88%)	56 (21.54%)
Number of fistula	40 (15.38%)	130 (50.00%)	90 (34.62%)	260 (100%)

TABLE 8
CORRELATION OF VASCULAR ANASTOMOSIS TYPE AND THE »SECONDARY PATENCY« (SECONDARY SURVIVAL) OF THE FISTULA

Fistula life-time	Vascular anastomosis type			Total
	End-to-end	End-to-side	Side-to-side	
»Secondary patency« (Fistula life-time) >2 years	21 (52.50%)	116 (89.23%)	73 (81.11%)	210 (80.77%)
Number of anastomosis	40 (15.38%)	130 (50.00%)	90 (34.62%)	260 (100%)

mosis, on 3 (2.31%) patients with end-to-side av. anastomosis, and in 5 (5.56%) patients with side-to-side av. anastomosis. The difference between the highest and the lowest assessment is 27.69% and it is statistically significant (χ^2 -test = 33.920; P=0.0001).

The »primary patency« (primary survival) of the AV-fistula has been monitored in such a way that we have established the number of observed patients who had developed some threatening complications 6 months after the establishment of the vascular access. After that we placed the assessment gain in juxtaposition to the type of applied vascular anastomosis in the AV-fistula (Table 7). It was found that some of the threatening complications occurred for the first time 6 months after the establishment of the vascular access in 25 (62.5%) patients with the end-to-end av. anastomosis, in 14 (10.76%) patients with the end-to-side av. anastomosis, and in 17 (18.88%) patients with the side-to-side av. anastomosis. The difference in percentages between the highest (62.50%) and the lowest (10.76%) assessment is 41.74% and it is statistically significant (χ^2 -test = 49.009; P=0.0001).

In addition, our research also determined the »secondary patency« (secondary survival) in all 260 examines based on how many of the AV-fistula were still functional 24 months after the establishment of the vascular access. This finding was then placed in juxtaposition to the applied type of vascular anastomosis in the AV-fistula (Table 8). It has been found that after the aforementioned time interval, the AV-fistula was still normally

functional in 21 (52.50%) patients with the end-to-end av. anastomosis, in 116 (89.23%) patients with the end-to-side av. anastomosis, and in 73 (81.11%) patients with the side-to-side av. anastomosis. The difference shown by percentages between the highest (89.23%) and the lowest (52.50%) assessment is 36.73% and it is statistically significant (χ^2 -test = 26.579; P=0,0001).

Discussion

The main problems in haemodialysis are related to vascular access. The peripheral vascular system of the organism provides limited possibilities for the recurrence of vascular access establishment. The types and incidence of complications again limit the lifetime of established accesses in dialysis patients. Both the aforementioned moments represent a major problem for the dialysis and transplantation centres in their attempts to preserve the established vascular approach for as long as possible. The main threat to the vascular approach, and consequently for the successful cure through haemodialysis, is represented by the complications, the occurrence of which is associated to the vascular approach. Complications are mostly responsible for the short life span of the established accesses, and consequently for complete morbidity and mortality in dialysis patients. This is the main problem that the expert scientific thought and daily clinical practice are engaged in⁴. Furthermore,

vascular surgeons and nephrologists²⁵ are equally committed to finding solutions to such problems.

There are three possible ways of vascular access for the implementation of haemodialysis: AV-fistula, AV-graft and central venous catheter. Each of these three ways has its own indications and limitations. The central venous catheter is used in specific and limited cases, and is not in routine clinic use. Various medical centres apply the AV-fistula or the AV-graft in the different percentages of patients. The majority of European centres for dialysis and transplantation view the AV-fistula as the access of choice^{8,22–25} whereas the application of the AV-graft^{1,2} is favoured in the majority of American centres.

During haemodialysis, numerous types of threatening complications for the vascular approach arise in patients. In short, they are: thrombosis, infection, »steal syndrome«, neuropathy, pseudoaneurism, as well as haemorrhaging. They can appear in all three types of vascular accesses established on the peripheral vascular system.

The lifetime of vascular access (primary, secondary and cumulative patency) both in the application of the AV-fistula and the AV-graft is limited, regardless the activities done. Extensive research has been made in order to prolong the lifetime of vascular access, in other words, to anticipate the emergence of complications as well as to eliminate and cure those that have already surfaced^{26,27}. For the purpose of anticipating the emergence of complications, progress has been made by the application of ultrasound examination of the vascular mapping of the limbs prior to the implementation of the vascular access^{3,13}.

Three types of arteriovenous anastomosis can be applied when establishing the AV-fistula: the end-to-end, the end-to-side, and the side-to-side type. We have raised the question of whether the type of applied vascular anastomosis in the AV-fistula can have influence the incidence of emerging complications. Only a few authors so far have raised this issue in the specialized journals. Fillinger and associates¹⁷ have raised a question whether end-to-end av. anastomosis has an advantage in maintaining the normal functioning of the AV-fistula when compare to end-to-side type. Raheb and associates¹⁹ have also pointed out that there is a certain correlation in dialysis patients between av. anastomosis in the AV-fistula and the emergence of complications. Krueger and associates²⁰ have again reported a more frequent appearance of intimal hyperplasia on the venous anastomosis of the vascular access in dialysis patients on whom the end-to-end type was applied. Zarin and associates²¹ have indicated that there is a possibly exists a correlation between the applied type of vascular anastomosis in the AV-fistula in dialysis patients and the incidence of complications.

In order to participate in the discussions concerning the possible correlation between the type of established

arteriovenous anastomosis in the vascular access and the incidence of threatening complications, we selected 260 patients treated with haemodialysis for our study. Only the patients with established AV-fistula were taken into consideration. We observed the fistulae relation of the applied arteriovenous anastomosis and the incidence of threatening complications. It was determined that the most frequent complication found in the 260 patients was thrombosis (Table 5). Moreover, it was determined that the highest incidence of thrombosis was found in the patients who were subjected to the end-to-end type of av. anastomosis in the establishment of the AV-fistula, considerably less in those with side-to-side anastomosis, and the lowest defined incidence was in those patients with end-to-side anastomosis (Table 6). The difference in the thrombosis incidence in the patients with the end-to-end type and those with the end-to-side type of arteriovenous anastomosis is statistically significant, which directs us to conclude that the end-to-end type of anastomosis creates the conditions in which thrombosis can develop easier than in the end-to-side and side-side type.

For the purpose of determining the »primary patency« (primary survival) of the vascular access in our patients, we monitored how many patients developed some threatening complications for the first time 6 months after the establishment of the vascular access. As it is illustrated in Table 7, there is a significantly higher number of patients with the end-to-end anastomosis who developed threatening complications in the aforementioned time interval, that is, within 6 months following the establishment of the AV-fistula, than in those patients with the other two types of anastomosis applied to them. In order to determine the relation between the »secondary patency« (secondary survival) and the established type of av. anastomosis in the vascular access, we examined in how many of patients the fistula was still normally functional 24 months after the establishment of the vascular access. As it can be seen from Table 8, in the specified time interval, the AV-fistula was functioning normally in a significantly greater number of patients with the applied end-to-side type of anastomosis than in those patients with the other two types of arteriovenous anastomosis applied to them. This finding also indicates that the application of the end-to-end type of arteriovenous anastomosis creates such conditions that help facilitate the development of thrombosis more so than other two types.

All the parameters examined as well as their relations indicate the advantages of the end-to-side type of arteriovenous anastomosis in the functional lifetime prolongation of the established AV-fistula and in the lower incidence of the complications in comparison to other two types.

REFERENCES

1. NKF-DOQI Clinical practice guidelines for vascular access, Am J Kidney Dis, 37 suppl 1 (1997) S150. — 2. NKF-K/DOQI Clinical practice guidelines for vascular access: Guideline 29: Goals of access placement – Maximizing primary AV fistulae. Am J Kidney Dis, 37 (suppl 1 (2001) S169. — 3. PARMLEY MC, BROUGHAN TA, JENNINGS WC, Am J Surg, 184 (2002) 568. — 4. SCHWAB SJ, Am J Kidney Dis, 34 (1999) pp xxxiii-xi. — 5. KAPOIAN T, SHERMAN RA, Seminars in Nephrol, 17 (1997) 239. — 6. ALBERS FJ, Adv Ren Replace Ther, 3 (1996) 208. — 7. MILES AM, Nephrol Dial Transplant, 14 (1999) 297. — 8. WEISWASER JM, SIDAWY AN. Strategies of arteriovenous dialysis access. In: RUTHERFORD RB (Ed) Vascular surgery (Elsevier Saunders, Philadelphia, 2005). — 9. GIBSON DK, CAPS MT, KOHLER TR, HATSUKAMI TS, GILLEN DL, ALDASSY M, SHERRARD DJ, STEHMAN-BREEN CO, Kidney Int, 59 (2001) 2335. — 10. PISONI RL, YOUNG EW, DYKSTRA DM, GREEWOOD RN, HECKING E, GILLESPIE B, WOLFE RA, GOODKIN DA, HELD PJ, Kidney Int, 61 (2002) 305. — 11. LAZARIDES MK, STARAMOS DN, MALTEZOS C, TZILALIS VD, Vascular access in the elderly. In: HENRY ML (Ed) Vascular access for Hemodialysis (WL Gore and associates, Inc, 2001). — 12. AR'RAJAB A, HENRY ML, Diagnosis the failing vascular access. In: HENRY ML (Ed) Vascular access for hemodialysis (WL Gore and Associates, Inc, 2001, 13-18). — 13. ROBBIN ML, GALLICHO MH, DEIERHOI MH, YOUNG CJ, WEBER TM, ALLON M, Radiol, 217 (2000) 83. — 14. FELDMAN HI, KOBRIN S, WASSERSTEIN A, J Am Soc Nephrol, 7 (1996) 523. — 15. HAKIM RM, HIMMELFARB J, Kidney Int, 54 (1998) 1029. — 16. GULATI S, SAHU KM, AVULA S, SHARMA RK, Renal failure, 25 (2003) 967. — 17. FIL-LINGER MF, KERNS DB, BRUCH D REINITZ ER, SCHWARTZ RA, J Vasc Surg, 12 (1990) 676. — 18. BRESCIA MJ, CIMINO JE, APPEL, HURWICH BJ, N Engl J Med, 275 (1996) 1089. — 19. RAHEB J, ESTERL R, REUTER R, WASHBURN W, LOWE J, MOORMAN G, CIGARRROA F, HALFF G, Ischemic monomelic neuropathy as a complication of forearm PTFE loop grafts in uremic diabetic patients. In: HENRY ML (Ed) Vascular access for Hemodialysis (WL Gore and Associates, Inc, 2001). — 20. KRUEGER U, HEISE M, HUHLE A, KRYS K, ZANOW J, SCHOLZ H, Effects of arterial and venous anastomotic design on hemodynamics in arteriovenous prosthetic grafts. In: HENRY ML (Ed) Vascular access for hemodialysis (WL Gore and Associates, Inc, 2001). — 21. ZARIN M, AHMAD I, WAHEED D, ZEB A, ANWAR N, ASLAM V, AYUB T, HAIDER Z, JCPSP, 14 (2004) 619. — 22. OLIVER MJ, McCANN RL, INDRIASON OS, BUTTERLY DW, Kidney Int, 60 (2001) 532. — 23. ALLON M, LOCKHART ME, LILLY RZ, Kidney Int, 60 (2001) 2013. — 24. PERWANI AD, REID JA, CONNOLLY JK, Patency and survival of primary arteriovenous fistulae. In: HENRY ML (Ed) Vascular access for hemodialysis. (WL Gore and Associates, Inc, 2001). — 25. MALIK J, SLAVIKOVA M, SVOBODOVA J, TUKA V, Kidney Int, 67 (2005) 1554. — 26. SANDS J, Blood Purification, 23 (2000) 45.

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PREDNOSTI TERMINO-LATERALNE PRED DRUGIM TIPOVIMA ARTERIOVENSKIH ANASTOMOZA U DIJALIZIRANIH

SAŽETAK

Funkcionalno trajanje vaskularnog pristupa u dijaliziranih ovisi o nastanku ugrožavajućih komplikacija. Vode se rasprave kako pronaći uzročnost i smanjiti njihov nastanak. Istraživali smo u 260 bolesnika na hemodijalizi da li postoji uzročno-posljedični odnos između nastanka komplikacija u vaskularnom pristupu i primijenjenog tipa arteriovenske (av) anastomoze u arteriovenskoj (AV) fistuli. Promatrali smo incidenciju svih komplikacija, incidenciju tromboze, a isto tako i »primarno« te »sekundarno« preživljavanje fistule. Kod bolesnika s termino-terminalnom anastomozom incidencija komplikacija je bila 8,08%, kod onih s termino-lateralnom 6,15, a 7,31% kod onih s latero-lateralnom. Razlika u incidencijama su statistički značajne (χ^2 -test = 29,25; P=0,0001). Tromboza je bila najčešća komplikacija i nastala je kod 30,00% ispitanika s termino-terminalnom av anastomozom, kod 2,31% onih s termino-lateralnom i kod 5,56% njih s latero-lateralnom. Razlika između najviše i najniže vrijednosti iznosi 27,69% i statistički je značajna (χ^2 -test = 33,920; P=0,0001). »Primarno preživljavanje« – U vremenskom intervalu od 6 mjeseci nakon uspostave vaskularnog pristupa javile su se prve komplikacije kod 62,50% ispitanika s termino-terminalnom av anastomozom, kod onih s termino-lateralnom 10,76.% i 18,88% kod onih s latero-lateralnom. Razlika između najviše i najniže vrijednosti iznosi 51,74% i statistički je značajna (χ^2 -test = 49,009%; P=0,0001%). »Sekundarno preživljavanje« – 24 mjeseca nakon uspostave vaskularnog pristupa AV-fistula je bila još u funkciji kod 52,50 % ispitanika s termino-terminalnom av anastomozom, kod 89,23% s termino-lateralnom i kod onih s latero-lateralnom 81,11%. Razlika između najviše i najmanje vrijednosti iznosi 36,73% i statistički je značajna (χ^2 -test = 26,579; P=0,0001). Prema rezultatima naših ispitivanja termino-lateralni tip av. anastomoze u vaskularnom pristupu daje bolje rezultate u trajanju i održavanju funkcionalnosti AV-fistule od druga dva tipa i stoga ima prednost.