

Basilic vein superficialization for hemodialysis vascular access

Hemodiyaliz vasküler erişim için bazilik ven yüzeyelleştirilmesi

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Background: This study aims to discuss the outcomes of superficialization of basilic vein technique in brachio basilic arteriovenous fistula formation and to present our experience.

Methods: Between January 2006 and January 2012, 170 patients (74 males, 96 females; mean age 60.7±9.1 years; range 31 to 83 years) who underwent basilic vein superficialization surgery in our clinic were included. All patients were examined under Doppler ultrasonography preoperatively. Demographic data of the patients, maturation time and complications were recorded. The mean follow-up was 12 months.

Results: Non-dominant upper limb was preferred for surgery. Of the 170 patients who were operated, 166 (97.6%) underwent hemodialysis. The mean maturation time was 61 days. Massive bleeding in the postoperative period occurred in two patients (1.2%). Wound infection was observed in eight patients (4.7%) in the early postoperative period. The most common reason for primary failure was thrombosis, which was observed in 48 patients (28.2%). The primary and secondary patency rates of the fistulas were 77% and 82%, respectively at one-year.

Conclusion: Arteriovenous fistula formation through superficialization of the basilic vein offers satisfactory results in chronic hemodialysis patients with reasonable postoperative complication rate.

Key words: Arteriovenous fistula; basilic vein; postoperative complication.

Amaç: Bu çalışmada, brakıyobazilik arteriyovenöz fistül oluşturulmasında bazilik ven yüzeyelleştirilmesi tekniğinin sonuçları tartışıldı ve deneyimlerimiz sunuldu.

Çalışma planı: Ocak 2006 - Ocak 2012 tarihleri arasında kliniğimizde bazilik ven yüzeyelleştirilmesi ameliyatı yapılan 170 hasta (74 erkek, 96 kadın; ort. yaş 60.7±9.1 yıl; dağılım 31-83 yıl) çalışmaya alındı. Ameliyat öncesi dönemde tüm hastalara Doppler ultrasonografi uygulandı. Hastaların demografik verileri, matürasyon zamanı ve komplikasyonlar kaydedildi. Ortalama takip süresi 12 ay idi.

Bulgular: Ameliyat için dominant olmayan üst ekstremitte tercih edildi. Ameliyat olan 170 hastanın 166'sı (%97.6), hemodiyalize girdi. Ortalama matürasyon zamanı 61 gün idi. İki hastada (%1.2) ameliyat sonrası dönemde masif kanama gelişti. Sekiz hastada (%4.7) erken ameliyat sonrası dönemde yara enfeksiyonu gözlemlendi. En sık primer başarısızlık nedeni tromboz olup, 48 hastada (%28.2) gözlemlendi. Birinci yılda fistüllerin primer ve sekonder açıklık oranı sırasıyla %77 ve %82 idi.

Sonuç: Bazilik ven yüzeyelleştirilmesi ile oluşturulan arteriyovenöz fistüller kronik hemodiyaliz hastalarında, makul ameliyat sonrası komplikasyon oranı ile tatminkar sonuçlar sunmaktadır.

Anahtar sözcükler: Arteriyovenöz fistül; bazilik ven; ameliyat sonrası komplikasyon.

End-stage renal disease (ESRD) is becoming an important health problem, and the long-term survival for patients with chronic renal failure can result in multiple operations for vascular access. The National

Kidney Foundation's Dialysis Outcomes Quality Initiative (NKF-NDOQI) primarily recommends autogenous arteriovenous access for chronic hemodialysis patients,^[1] but the Brescia-Cimino fistula



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is still used the most followed by the brachiocephalic arteriovenous fistula at the elbow level. Basilic vein transposition was first described in 1976 and is a reliable procedure for secondary vascular access.^[2,3] Whenever the forearm vessels are not suitable for arteriovenous fistula creation or when these fistulas have failed, the options for vascular access are either the brachial-basilic arteriovenous fistula or a prosthetic graft;^[4,5] however, basilic vein transposition has fewer complications and better patency rates than the grafts.^[6]

In this study, the superficialization of the basilic vein technique was utilized to achieve brachiobasilic arteriovenous fistula access at a single institution, and the results were then analyzed.

PATIENTS AND METHODS

Between January 2006 and January 2012, 170 consecutive patients (74 males, 96 females; mean age 60.7 ± 9.1 years; range 31 to 83 years) who underwent basilic vein superficialization for brachiobasilic arteriovenous fistula access at a single institution were included in this study. All patients in the study group had previously undergone failed radial-cephalic and brachial-cephalic arteriovenous fistula operations. Non-dominant left upper extremities were preferred in 112 patients (65.9%). The most frequently associated diseases with this procedure were hypertension in 88 patients (51.8%), diabetes in 72 (42.4%), and peripheral arterial disease (PAD) in 36 others (21.2%). The demographic data of the patients and their maturation times are detailed in Table 1.

Preoperatively, all of the patients were examined via Doppler ultrasonography (USG) for vein mapping.

In addition, the basilic, cephalic, subclavian, and jugular veins were evaluated for stenosis and occlusion.

The operations were performed under local anesthesia using 20-40 ml 2% prilocaine. At the beginning, a 3 cm incision was made in the antecubital fossa, and the brachial artery and basilic vein were explored (Figure 1). In addition, a separate 6-8 cm skin incision was also made to explore the proximal part of the basilic vein. Next, the side branches of the basilic vein were ligated, and the vein was transected as distally as possible. In doing so, the median antebrachial cutaneous nerve was carefully spared to avoid disturbing this nerve. The basilic vein was then divided at the level of the antecubital fossa and transported over the deep fascia under the skin. Following this, it was gently dilated with heparinized saline for enlargement. Anastomosis was completed using an end-to-side technique with 7/0 polypropylene sutures (Figure 2), and a minivac drain (Bıçakçılar, İstanbul, Turkey) was inserted through a subcutaneous tunnel in each patient. Afterwards, the deep fascia was reapproximated with separated sutures under the vein, and the skin was closed. The patients were discharged the day after the surgery.

Surgical success was achieved if there was the presence of a bruit or thrill on the arteriovenous fistula. Primary patency is defined as the point at which the fistulas were functioning for dialysis up to the time of the first failure, and secondary patency is defined as the interval from the time of access placement until access abandonment, regardless of the number of interventions required to maintain patency.^[2] All of our patients were followed up for 12 months postoperatively, and any complications and related interventions were recorded.

Table 1. Demographic data of the patients and maturation time

	n	%	Mean±SD	Range
Age (years)			60.7±9.1	
Gender				
Male	74	43.5		
Female	96	56.5		
Site of operation				
Left arm	112	65.9		
Right arm	58	34.1		
Associated disease				
Hypertension	88	51.8		
Diabetes mellitus	72	42.4		
Peripheral arterial disease	36	21.2		
Coronary artery disease	12	7.1		
Maturation time (days)			61	45-72

SD: Standard deviation.

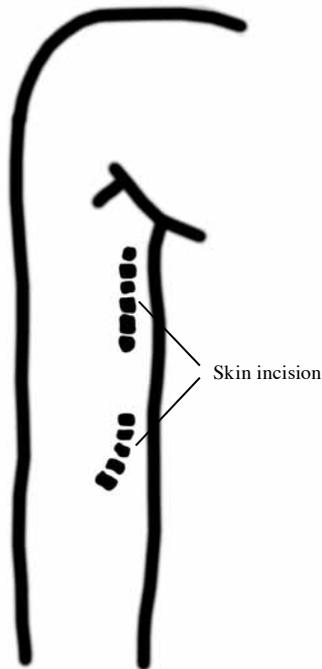


Figure 1. Skin incision for basilic vein superficialization.

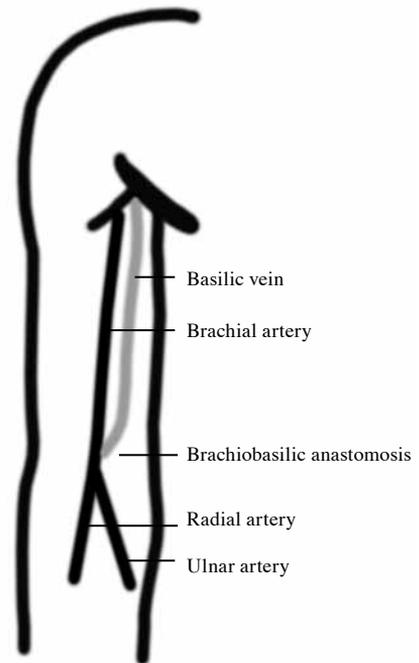


Figure 2. Schematic view for basilic vein superficialization.

Statistical analysis

Statistical analyses were performed with the SPSS for Windows version 11.0 (SPSS Inc., Chicago, IL, USA) software program, and the data was analyzed with the Kaplan-Meier test to determine the primary and secondary patency rates.

RESULTS

Of the 170 patients who were operated on for basilic vein superficialization, 166 (97.6%) underwent hemodialysis. Poor flow rates were detected in the other four patients, and another arteriovenous fistula access via a different upper extremity location was performed in them. The mean period for the first needling was 61 days (range 45-72).

Postoperative complications following the superficialization of the basilic vein fistula are listed in Table 2. Massive bleeding in the postoperative period occurred in two patients (1.2%), with the source in both being bleeding from the anastomotic line. However, this was easily controlled with an additional 7/0 polypropylene, and all of the fistulas were patent after the surgery.

Wound infection in the early postoperative follow-up was observed in eight patients (4.7%), and all of these cases were treated with antibiotics. Hence, no additional surgical revision was required.

In the routine follow-up of the patients, the most common reason for primary failure was thrombosis, which was observed in 48 patients (28.2%), and all of them underwent a thrombectomy or segmental access replacement under local anesthesia. After exploring the arterial and venous segments of the fistula, the thrombectomy was performed. In eight patients, we observed a stenotic venous segment close to the anastomotic region. After the procedure,

Table 2. Postoperative complications following the superficialization of the basilic vein fistula

	n	%
Early complication		
Bleeding	16	9.4
Massive	2	1.2
Minimal	14	8.2
Wound infection	8	4.7
Late complication		
Thrombosis	48	28.2
Ischemic steal	20	11.8
Mild	14	8.2
Severe	6	3.5
Poor flow	4	2.4
Edema	26	15.3
Transient	25	14.1
Massive	1	0.6
Aneurysm	16	9.4

this venous segment was removed, and a 6 mm polytetrafluoroethylene (PTFE) graft measuring 2-4 cm in length was interposed for the segmental access replacement in order to maintain the flow through the arteriovenous fistula. In the remaining 32 patients, only a thrombectomy was necessary. The operation was successful in 40 of the patients. In the remaining eight, another arteriovenous fistula was created. In six patients (3.5%), severe arterial steal syndrome occurred, and these underwent a reoperation for banding. In addition, upper extremity edema developed in 26 patients (15.3%), and 24 of these were transient in nature. Ligation of the fistula was only necessary in one patient due to massive arm edema. At the one-year follow-up, the primary patency of the fistula was 77% and the secondary patency was 82%.

DISCUSSION

Autologous arteriovenous hemodialysis has been the gold standard for the treatment of chronic hemodialysis patients,^[7] and a radiocephalic fistula in the nondominant arm is the first choice for arteriovenous fistula operations.^[8] However, access via a brachio basilic arteriovenous fistula is increasingly becoming the procedure of choice when a superficial arm vein is unavailable.^[7] The basilic vein is long, deeply positioned, and generally free of puncture with a relatively large diameter and higher venous flow along with high patency and maturation rates.^[7] The main disadvantage of this technique is the location of the fistula on the inner aspect of the upper arm.

In complicated cases, a surgeon must sometimes decide between a prosthetic graft and a native arteriovenous fistula for vascular access, with the fistulas having a lower incidence of infection and longer patency rates.^[6,9-12] The disadvantages of basilic vein superficialization include the possibility of vein injury during exploration and mobilization, wound complications related to the extensive dissection, longer operating times, and injury to the median and cutaneous nerves.^[9,13] At our facility, native arteriovenous fistulas are our first choice for vascular access.

The basilic vein superficialization operation can be planned as a single-stage or a two-stage procedure,^[14,15] and elevation allows for the use of a longer and straighter length of fistula.^[15] Bronder et al.^[15] reported on fistula elevation procedure results in 295 cases and found no difference in the number of complications compared with fistulas transposed through a separate tunnel. Kakkos et al.^[16] suggested an individualized approach in choosing the method for performing the basilic vein transposition and also indicated that the

two-stage basilic vein transposition fistula through two skip-arm incisions was superior to the established one-stage procedure due to less morbidity. However, this procedure is performed at the cost of a second operation and longer access times. We planned and performed elevation and anastomosis via the single-stage method for the patients in this study, with the elevation of the basilica vein being performed after the dissection of the deep fascia.

A preoperative evaluation of the upper extremity veins and subclavian vein by Doppler USG is highly recommended,^[17] and preoperative vein mapping should be performed, especially for patients with no obviously useful superficial veins or those who have previously undergone the creation of an upper arm fistula.^[14] This may improve the outcome of the fistula operation with regard to postoperative success rates.^[17] Additionally, venography and multislice spiral computed tomography angiography can also be used to evaluate vascular structures. At our facility, we routinely perform vein mapping for all of our patients using Doppler USG.

Conclusion

Basilic vein superficialization is a viable alternative for dialysis access in patients with chronic renal failure. In addition, arteriovenous fistula surgery via the superficialization of the basilic vein offers satisfactory results in chronic hemodialysis patients with reasonable postoperative complications.

Declaration of conflicting interests

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REFERENCES

1. I. NKF-K/DOQI Clinical Practice Guidelines for Hemodialysis Adequacy: update 2000. *Am J Kidney Dis* 2001;37:S7-S64.
2. Sidawy AN, Gray R, Besarab A, Henry M, Ascher E, Silva M Jr, et al. Recommended standards for reports dealing with arteriovenous hemodialysis accesses. *J Vasc Surg* 2002;35:603-10.
3. Morosetti M, Cipriani S, Dominijanni S, Pisani G, Frattarelli D, Bruno F. Basilic vein transposition versus biosynthetic prosthesis as vascular access for hemodialysis. *J Vasc Surg* 2011;54:1713-9.
4. Odabaşı D, Arı E, Kıymaz A, Ekim H. Should we use saphenous vein graft instead of synthetic graft for creation of

- secondary arteriovenous fistula in hemodialysis dependent end stage renal failure patients? *Turk Gogus Kalp Dama* 2012;20:209-16.
5. Hastaoğlu İO, Bilgen F. Basilic vein transposition performed for hemodialysis access: mid-term results. *Turk Gogus Kalp Dama* 2011;19:513-7.
 6. Keuter XH, De Smet AA, Kessels AG, van der Sande FM, Welten RJ, Tordoir JH. A randomized multicenter study of the outcome of brachial-basilic arteriovenous fistula and prosthetic brachial-antecubital forearm loop as vascular access for hemodialysis. *J Vasc Surg* 2008;47:395-401.
 7. Veeramani M, Vyas J, Sabnis R, Desai M. Small incision basilic vein transposition technique: a good alternative to standard method. *Indian J Urol* 2010;26:145-7.
 8. Brescia MJ, Cimino JE, Appel K, Hurwich BJ. Chronic hemodialysis using venipuncture and a surgically created arteriovenous fistula. *N Engl J Med* 1966;275:1089-92.
 9. Oliver MJ, McCann RL, Indridason OS, Butterly DW, Schwab SJ. Comparison of transposed brachio-basilic fistulas to upper arm grafts and brachiocephalic fistulas. *Kidney Int* 2001;60:1532-9.
 10. Sala Almonacil V, Plaza Martínez A, Zaragoza García J, Martínez Parreño C, Al-Raies Bolaños B, Gómez Palónés F, et al. Comparison between autogenous brachial-basilic upper arm transposition fistulas and prosthetic brachial-axillary vascular accesses for hemodialysis. *J Cardiovasc Surg (Torino)* 2011;52:725-30.
 11. Basel H, Ekim H, Odabasi D, Kiymaz A, Aydin C, Dostbil A. Basilic vein transposition fistulas versus prosthetic bridge grafts in patients with end-stage renal failure. *Ann Vasc Surg* 2011;25:634-9.
 12. Rahman A, Özsin KK. Late complications requiring revision of arteriovenous fistulae for hemodialysis. *Turk Gogus Kalp Dama* 2008;16:167-71.
 13. Rao RK, Azin GD, Hood DB, Rowe VL, Kohl RD, Katz SG, Weaver FA. Basilic vein transposition fistula: a good option for maintaining hemodialysis access site options? *J Vasc Surg* 2004;39:1043-7.
 14. Korkut AK, Kosem M. Superficialization of the basilic vein technique in brachio-basilic arteriovenous fistula: surgical experience of 350 cases during 4 years period. *Ann Vasc Surg* 2010;24:762-7.
 15. Bronder CM, Cull DL, Kuper SG, Carsten CG, Kalbaugh CA, Cass A, et al. Fistula elevation procedure: experience with 295 consecutive cases during a 7-year period. *J Am Coll Surg* 2008;206:1076-81.
 16. Kakkos SK, Haddad GK, Weaver MR, Haddad RK, Scully MM. Basilic vein transposition: what is the optimal technique? *Eur J Vasc Endovasc Surg* 2010;39:612-9.
 17. Woo K, Farber A, Doros G, Killeen K, Kohanzadeh S. Evaluation of the efficacy of the transposed upper arm arteriovenous fistula: a single institutional review of 190 basilic and cephalic vein transposition procedures. *J Vasc Surg* 2007;46:94-99.