Comparison Primary Failure and Primary Patency Rates of Distal Radiocephalic Arteriovenous Fistulas in Diabetic and Non Diabetic Patients

El Bileğinden Yapılan Radiosefalik Arteriovenöz Fistüllerin Başarısızlık ve Açıklık Sürelerinin Diyabetik ve Diyabetik Olmayan Grupta Karşılaştırılması

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ABSTRACT Objective: The radiocephalic arteriovenous fistula (avf) at the wrist is the first choice for hemodialysis access. Several authors have reported diabetes mellitus (DM) as an independent risk factor on primary failure and patency of the fistula, also reports stating that DM is only a clinically comorbid factor. We aimed to investigate the effect of DM on primary failure and patency rates of distal radiocephalic avf. **Material and Methods:** 87 patients (43 diabetic and 44 non diabetic) who underwent distal radiocephalic avf operations between May 2011-January 2013 were reviewed retrospectively. Demographic findings and data about radial artery and cephalic vein were documented. Primary failure and 6 months primary patency of the fistula were also calculated retrospectively. **Results:** The mean cephalic vein diameters were similar but the mean radial artery diameter (2.34±0.26 mm versus 2.63±0.38 mm, p=0.0002) and the mean radial artery flow (25.05±11.8 ml/min versus 28.9±11.3 ml/min. p=0.0277) of the diabetic group were significantly lower. There were no significant differences on primary failure and primary patency rate for 6 months. **Conclusion:** Even though the mean radial artery diameter and flow were lower in diabetic group, there are no significant differences at primary failure and patency rates. By so we conclude that DM is not an independent risk factor on primary failure or patency rate of the fistula but may be a comorbid factor. Radiocephalic arteriovenous fistula at the wrist remains our first choice for both diabetic and non-diabetic patients.

Key Words: Diabetes complications; arteriovenous fistula; kidney failure, chronic

ÖZET Amaç: Kronik böbrek yetmezlikli hastalarda hemodiyaliz tedavisinin el bileği seviyesinde oluşturulan radiosefalik arteriovenöz fistül (avf) ile yapılması ilk tercih edilen yöntemdir. Bazı otörler Diabetes Mellitus (DM) hastalığını, fistülün açıklık süresinde ve olgunlaşma başarısızlığı konusunda net olarak olumsuz bir risk faktörü olarak tanımlasa da bazıları bu durumu sadece klinik bir komorbidite olarak tanımlamaktadır. Biz de bu çalışmamızda bu çelişkili durumu aydınlatmayı planladık. **Gereç ve Yöntemler:** Hastanemizde Mayıs 2011-Ocak 2013 tarihleri arasında el bileği seviyesinden avf ameliyatı olan 87 hastanın (43 diyabetik ve 44 diyabetik olmayan) demografik verileri ile radial arter ve cephalic ven ile ilgili verileri geriye doğru tarandı. Fistül olgunlaşmasında başarısızlık durumu ile 6 aylık açıklık süreleri incelendi. **Bulgular:** Ortalama sefalik ven çapları arasında fark yok iken, ortalama radial arter çapı (2,34±0,26 mm ve 2,63±0,38 mm, p=0,0002) ve ortalama radial arter akımı (25,05±11,8 ml/dak ve 28,9±11,3 ml/dak, p=0,0277) diyabetik grupta diyabetik olmayan gruba göre anlamlı oranda düşük tespit edildi. Fistül olgunlaşmasında başarısızlık ve 6 aylık açıklık oranları arasında ise anlamlı bir fark bulunmadı. **Sonuç:** Radial arter çapı ve akımı diyabetik grupta daha düşük saptansa da olgunlaşma başarısızlığı ve 6 aylık fistül açıklık oranları arasında anlamlı fark saptanmamıştır. Böylece DM hastalığının tek başına bağımsız bir risk faktörü olmadığı, sadece komorbidite faktörlerinden birisi olduğu görüldü. Bu durumda hem diyabetik hem de diyabetik olmayan hastaların hemodiyaliz tedavisinde el bileği seviyesinden açılan avf hala ilk seçenek olmalıdır.

Anahtar Kelimeler: Diyabet komplikasyonları; arteriyovenöz fistül; böbrek yetmezliği, kronik

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Vascular access for chronic hemodialysis has classically been initiated by the creation of a primary radial artery to cephalic vein arteriovenous fistula (AVF).

Diabetes mellitus (DM) is a chronic disease which is in the first place at the etiology of end-stage renal disease (ESRD) and also adversely affects vascular structures. For this reason, distal vascular access initiatives in diabetic patients with ESRD may expected to have lower primary patency rates and higher primary failure. DM disease was reported as an independent risk factor on AVF primary failure and patency rates in some studies, whereas DM was not considered as an independent risk factor but described as only a comorbidity factor in some other studies.[1-6]

We aimed to investigate this conflict by comparing the primary failure and patency rates of distal radiocephalic arteriovenous fistula (RC-AVF) in diabetic and non diabetic patients retrospectively.

MATERIAL AND METHODS

PATIENT INFORMATION

Between May 2011 and January 2013, distal RC-AVFs were created at 87 patients as the primary vascular access initiative. Forty three patients were diabetic and 44 were non diabetic.

PREOPERATIVE EVALUATION

According to the AVF protocol performed in our clinic, all patients were preoperatively examined by doppler USG. Only the patients who had distal radial artery diameter over 1,7 mm and distal cephalic vein diameter over 2 mm underwent distal RC-AVF operation. Arterial circulation of the hand was assessed with the modified Allen test. The patients were admitted the day before the surgery.

TECHNIQUE OF DISTAL RC-AVF

A longitudinal incision at 5-6 cm upper side of the wrist was made between the cephalic vein and radial artery under local anesthesia. Cephalic vein branches were ligated with 3-0 silk suture. End-to-side anastomosis was performed between artery and vein by using 7-0 polypropylene suture. All patients were operated on by the same surgeons (CK,TK,BK) and all were discharged at the day of surgery.

Fistulas were needed 4-8 weeks for to be mature before using for cannulation. A fistula was assumed as mature when it could provide a minimum blood flow as 350-450 ml/min for effective hemodialysis in 3-5 hours and could be cannulated easily.[7]

POSTOPERATIVE EVALUATION

Patients had evaluated in our outpatient clinic. Demographic data as age, gender, operation date, hypertension, smoking and history of temporary dialysis catheter, heart pacemaker, congestive heart failure were recorded.

Doppler ultrasound examinations such as cephalic vein diameter, radial artery diameter and radial artery flow were noted. Postoperative complications such as bleeding, early thrombosis, hematoma, infection, ischemia, and venous hypertension were evaluated.

Primary end points of this study were having succesfull hemodialysis treatment over then 6 months, primary failure and the death.

Primary failure was assumed as an AVF which was not allowed to have an effective hemodialysis treatment or thrombosed before the first cannulation. Primary failure definition had included inadequate maturation, early thrombosis, failure of first cannulation, and other complications such as ischemia or infection.[8]

Statistical evaluation was done with the Graphpad InStat 3.06 (San Diego, CA, USA) program and data were evaluated by Mann-Whitney test. $p<0.05$ was considered significant.

RESULTS

In terms of demographic data (age, gender, history of catheter, non-dominant arm, history of pacemaker, congestive heart failure) between diabetic and non-diabetic patients there was no statistically significant difference except hypertension (Table 1). Hypertension was significantly higher in the diabetic group (95.3% versus 77.3% p=0.0154).

TABLE 1: Demographic data of the diabetic group and the non diabetic groups.

	Diabetic Group	Non Diabetic Group	p value
Age (year)	64±11.2	61.1±15.5	0.5522
Gender (M/F)	29/14	29/15	0.8843
Hypertension	95.3%	77.3%	0.0154*
History of catheter	51.2%	43.2%	0.4615
Smoke	18.6%	22.7%	0.6414
Dominant arm	4.7%	2.3%	0.5546
History of pacemaker	4.7%	4.5%	0.9907
Congestive heart failure	13.9%	4.5%	0.1334

Data of age are expressed as mean ± stantard deviation, the others were expressed as a percentage.
All comparisons were analyzed with Mann-Whitney U test
*p<0.05 was considered as statistically significant.

The mean diameter of cephalic vein between the groups was similar. The mean diameter (2.34±0.26 versus 2.63±0.38 p= 0.001) and flow (25.05±11.80 versus 28.91±11.27, p=0.027) of the radial artery had found to be significantly lower in the diabetic group when compared with non-diabetic group (Table 2). When primary failure (32.6% versus 34.1, p=0.3105) and patency rate for 6 months (67.4% versus 65.9%, p=0.1843) of the two groups were compared, no statistically significant difference was detected and the results were so similar (Table 3).

During follow up in our study no death was identified. Two patients at non diabetic group and three patients at diabetic group were reoperated successfully because of hematoma. Primary failure were detected at 14 patients in diabetic group; 1 inadequate maturation, 13 early thrombosis and at the other hand 15 patients due to early thrombosis were determined in non diabetic group. Twenty nine patients at both two groups were able to have a successful hemodialysis treatment by the fistula and no access loss was detected during 6 months follow up at both groups.

DISCUSSION

It is obvious information that DM affects all vascular structures and by so this disease can causes a high risk for primary failure of the hemodialysis fistulas.[9]The question to be asked here is what should be done, when we have a diabetic patient with regular vascular structures for distal RC-AVF. Should we try distal attempt or try more proximal sites as a first choice?

Pisoni et al evaluated 6,400 patients; younger age, male gender, low body mass index, not being diabetic, absence of angina and peripheral vascular disease has been identified as positively influencing factors on fistula maturation and primary patency rates.[2]

On the other hand in a study in which 298 arteriovenous fistulas were evaluated, only the diameter of the vein has been identified as an independent risk factor on fistula maturation and age, gender, body mass index, diabetes had no negative effects on maturation.[6]

Miller examined 101 arteriovenous fistulas, 47 of them have been matured and successfully dialyzed; diabetes, obesity and being over 65 have been found to affect fistula primary patency rate negatively. Moreover, being female has been shown as a negative factor on fistula maturation.[10]

The mostly cited study about diabetes and fistula maturation is Hakaim's document.[11] Hakaim et al. performed a study with 58 diabetic patients. 10 diabetic patients were underwent distal RC-AVF operations and other 48 diabetic patients were operated at the upper arm. When compared the diabetic distal and diabetic upper arm fistulas, primary failure (70% versus 12% p<0.05) and primary pa-

TABLE 2: Doppler ultrasound data of diabetic and non diabetic groups.

	Diabetic Group	Non Diabetic Group	p value
Distal cephalic vein diameter (mm)	2.32±0.37	2.45±0.42	0.093
Distal radial artery diameter (mm)	2.34±0.26	2.63±0.38	0.001*
Distal radial artery flow (ml/min)	25.05±11.80	28.91±11.27	0.027*

Data are expressed as mean ± stantard deviation and were analyzed with Mann-Whitney U test.
* p<0.05 was considered as statistically significant.

TABLE 3: Primary patency and failure rate of diabetic and non diabetic groups.

	Diabetic Group n: 43	Non Diabetic Group n:44	p value
Primer patency for 6 months	67.4%	659%	0.1843
Primary Failure	32.6%	34.1%	0.3105

Data were expressed as a percentage and were analyzed with Mann-Whitney U test.
* P <0.05 was considered as statistically significant.

tency rates for 18 months (33% versus 79% p<0.05) were so significantly lower at diabetic distal fistula group.

Preoperative radial artery flow less than 40 ml/min and radial artery diameter less than 2 mm were reported as factors effecting primary patency rates negatively.[12,13] So the radial artery diameter and flow may have an important role on patency of the fistula such as vein diameter.

Even the mean radial artery diameter and flow were statistically lower in diabetic group in our study, there is no significant difference at primary failure and primary patency rates between the two groups. So low radial artery diameter and flow may not be responsible for primary failure of the fistula and may not have any effects on primary patency rates.

RC-AVF at the wrist remains our first choice for vascular access in diabetic patients as in non-diabetic patients depending on the satisfactory results. So we conclude that DM is not an independent risk factor on primary failure or patency rate of the distal RC-AVF but may be a comorbid factor in some patients.

Even if the patient is diabetic or not we suggest try distal RC-AVF as a first choice when suitable vein and artery were recorded. “Fistula first, distal first” should be a rule for patients at each groups.

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