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IS IT POSSIBLE TO PREDICT THE MATURATION OUTCOME OF THE ARTERIOVENOUS FISTULAS FOR HEMODIALYSIS BASED ON MORPHOLOGICAL AND FUNCTIONAL PARAMETERS OF BLOOD VESSELS?

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INTRODUCTION

Although native radiocephalic arteriovenous fistula (RCAVF) is the best vascular access for hemodialysis (HD), a significant failure-to-mature rate is barrier to overcome. Aim of the study was to investigate the influence of different morphologic and functional parameters on AVF maturation, to define the most important factors and suggest (according to obtained results) a clinical algorithm for prediction of the radiocephalic AVF maturation.

METHODS

A prospective, observational study was performed on 122 patients (66 men) with terminal kidney failure who underwent native radiocephalic AVF creation. Internal diameters if cephalic vein (Cvd) and radial artery (Ard), venous distensibility (VD), resistance index (RI) and endothelial function by flow mediated dilatation (FMD) were determined by ultrasound examination before AVF placement. AVF maturation was observed by measuring blood flow (Qa) and Cvd. Depending on attained maturity criteria after 8 weeks (Qa> 500ml/min, CVd> 5mm), patients were divided in two groups:
- group 1 (n= 109)- successful maturation
- group 2 (n= 13)- failure to mature.

RESULTS

Successful AVF maturation was achieved in 89% of pts. ROC analysis defined the limits of variables relevant for early AVF success (CVd >1.8 mm, ARd >1.6 mm, VD >0.4 mm). Logistic regression analysis confirmed the results obtained by ROC analysis and multiple regression analysis singled out the VD as the most important parameter influencing the outcome of AVFs maturation (OR=7.22). Based on the obtained results, clinically simplified equation with scoring applicable to everyday practice was made in order to predict the early outcome of AVF maturation.

$$\text{Logit (p)} = 1.11 \times (\text{CVd.}) + 1.97 \times (\text{VD}) + 0.61 \times (\text{ARd}) - 4.83$$

CONCLUSIONS

The key parameters for the success AVFs maturation are functional and morphological: VD, ARd and CVd. Based on their preoperative measurements it is possible to predict the outcome of AVF maturation.

KEY WORDS

arteriovenous fistula, hemodialysis, vessel characteristics, ultrasonography, prediction of maturation, vein distensibility.

Table 1: Risk score of success early AVF maturation with clinical application.

Score	Risk category	Clinical application
3,5- 4,5	Very high risk	Consider another option for vascular access (AVG, tunnel CVC)
4,5- 7	High risk	Detailed preoperative evaluation and AVF creation with special care and continuous supervision to final maturity
7- 9	Moderate risk	Acceptable risk of AVF creation
9- 10	Low risk	High probability of success AVF

Assumed risks of success AVF outcomes with clinical application.