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Prediction for maturation of arteriovenous fistula by vascular ultrasonography

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Objectives : Vascular access formation is an important step in starting hemodialysis therapy. However, because most patients with end stage renal disease have poor vascular condition, the rate of success in maturation of arteriovenous fistula (AVF) is lower than expected. We aim to investigate the predictors for successful AVF maturation through the ultrasound examination which was performed at pre and post AVF surgery.

Methods : We collected the data of vascular sonography from the seventy patients undergoing AVF formation surgery. We performed ultrasound vascular mapping as a pre-evaluation searching appropriate vessels for AVF, and followed it at around one-month after the surgery to evaluate whether the AVF is maturated possible to use for hemodialysis. In the ultrasonography, we measured the diameter of artery (A1) and vein (V1) before surgery, and feeding artery (A2) and AVF (V2) after AVF formation. Additionally, we evaluated blood flow (Bf) of AVF and calculated the change of diameter in artery (A2-A1, delta A) and vein (V2-V1, delta V).

Results : Thirty-seven men and thirty-three women comprised of the subjects. The mean age was fifty-nine years old. We defined the cases with Bf<600 mL/min as a poor maturation group and the other cases with Bf>600 mL/min as a good maturation group.
The independent T-test showed that there were significant differences in the parameters of A2 (poor vs. good; 4.0±1.1 vs. 5.1±1.2 mm, p=0.003), delta A (0.7 vs. 1.2 mm, p=0.025), V2 (4.5 vs. 5.7 mm, p<0.001) and delta V (1.3 vs. 2.1 mm, p=0.001) between the poor and good maturation groups. ROC analysis demonstrated that 4.0 mm of A2, 0.6 mm of delta A, 4.9 mm of V2 and 4.2 mm of delta V were suggested to predict good AVF maturation. In pearson's correlation analysis, Bf of AVF had the positive relationships with A1 (p=0.005), A2 (p<0.001), delta A (p<0.001), V1 (0.002) and V2 (p<0.001). In regression test, the results demonstrated that delta A best predict the success in the AVF maturation.

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Conclusions : In conclusion, the change of the arterial diameter between before and after the AVF formation is the most important factor for AVF maturation.

Keywords : Vascular sonography, arteriovenous fistula, maturation