

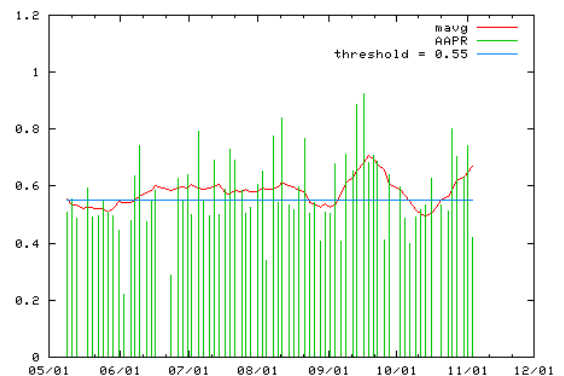
# Arterial Pressure Ratio Test for Hemodialysis Access Monitoring of Arteriovenous Grafts and Fistulas<sup>1</sup>

## BACKGROUND

An algorithm has been developed to detect arterial stenosis by recording the pre-pump arterial drip chamber pressure (ADP) and the corresponding dialysis machine blood pump flow rate (Qb). The arterial access pressure ratio (AAPR) is determined by dividing the absolute value of ADP by Qb. The AAPR is determined each time the Vasc-Alert program calculates the venous access pressure ratio during a dialysis treatment. A mean treatment AAPR value is calculated from the individual treatment AAPR values. AAPR values, obtained from every dialysis treatment that the patient receives, are monitored by a computer information system. If AAPR is greater than 0.55 for three consecutive treatments, a warning is generated to inform the dialysis unit staff that there is problem with the patient's access at the arterial input to the access.

## METHODS

For a period of one month, 164 hemodialysis patients (pts), 98 with grafts (AVG) and 66 with fistulas (AVF), underwent arterial pressure ratio testing (AAPRT). Arterial-side access outcomes were monitored for 6 months following the month of monitoring. Sensitivity and specificity of AAPRT to predict an arterial-side access event, defined by thrombosis or requirement for angioplasty, were calculated.



Graph showing arterial access pressure ratio values for one patient over 5 months

## RESULTS

The statistical analysis of the AAPRT is shown in the table below. For the 3-month follow-up period, the test sensitivity of AAPRT for AVG was 100% and specificity 91.7%. During the 6-month follow-up period sensitivity remained at 100% and specificity increased slightly to 96.7%. Positive predictive value increased from 20% to 70% for AVG. For AVF during the 3-month follow-up period, the test sensitivity of AAPRT was 100% and specificity 91.8% and during the 6-month follow-up period sensitivity remained at 100% and specificity increased slightly to 94.9%. Positive predictive value increased from 50% to 70% for AVF.

## CONCLUSIONS

AAPRT has very good sensitivity and specificity for predicting a restriction in the inflow to AVG and AVF. The negative predictive value of the AAPRT is excellent at 100%. Positive predictive value increased to a reasonable value of 70% in the 6-month follow-up period. AAPRT is an excellent surveillance method to prospectively monitor AVG and AVF for dysfunction at the arterial input to the access.

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## AAPR Test Results

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### Results for AV Grafts

	<b>Test Period 0 to 3 months</b>	<b>Test Period 0 to 6 months</b>
True Positive	2	7
False Positive	8	3
False Negative	0	0
True Negative	88	88
<b>Total</b>	<b>98</b>	<b>98</b>
<b>Sensitivity</b>	100.0	100.0
<b>Specificity</b>	91.7	96.7
<b>Positive Predictive Value</b>	20.0	70.0
<b>Negative Predictive Value</b>	100.0	100.0
<b>Prevalence</b>	2.0	7.1
<b>True Positive Rate</b>	100.0	100.0
<b>False Positive Rate</b>	8.3	3.3

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### Results for AV Fistulas

	<b>Test Period 0 to 3 months</b>	<b>Test Period 0 to 6 months</b>
True Positive	5	7
False Positive	5	3
False Negative	0	0
True Negative	56	56
<b>Total</b>	<b>66</b>	<b>66</b>
<b>Sensitivity</b>	100.0	100.0
<b>Specificity</b>	91.8	94.9
<b>Positive Predictive Value</b>	50.0	70.0
<b>Negative Predictive Value</b>	100.0	100.0
<b>Prevalence</b>	7.6	10.6
<b>True Positive Rate</b>	100.0	100.0
<b>False Positive Rate</b>	8.2	5.1

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