ANNEXES TO CHAPTER 4

Clinical Question XII. Which non-invasive monitoring or surveillance screening method for haemodialysis arteriovenous fistula presents predictive power of stenosis and thrombosis and increased patency of the prosthetic arteriovenous fistula in the prevalent patient and what is the frequency?

There are two main non-invasive monitoring options for patients with grafts on haemodialysis. The first is normal clinical monitoring of the vascular access, based on physical examination and/or presence of clinical signs of dysfunction; signs such as difficulty inserting the cannula or prolonged bleeding after dialysis. The second option involves different variants of active surveillance, including measuring blood flow (Qa) and measuring venous blood pressure during dialysis. In both tests, when the results cross a certain predetermined threshold, patients are referred for intervention to try to correct the stenosis.

We found two systematic reviews, both published the same year, with meta-analyses that address the clinical effects of these two options: Tonelli (2008) and Casey (2008). The Tonelli review only includes randomised clinical trials (RCT), whereas Casey also includes non-randomised studies. Both articles identified the same RCT and came to the same conclusions. Two more recent reviews (Work 2011; Kumbar 2012) were unable to find any new RCT. For these CPG, we refer to the Tonelli meta-analyses (2008) as they provide more complete data on the stratified analysis for patients with graft.

Predictive power for stenosis or thrombosis

Narrative review by Paulson (2002) reports that studies evaluating the predictive power of active surveillance techniques, measuring blood flow (Qa) and dialysis venous blood pressure, for graft thrombosis using ROC curve analysis concluded that the results of these techniques were very inaccurate predictors of graft thrombosis. The authors discuss a study (Ram 2008) where monthly Qa pressure measurements provided a sensitivity of 80% in prediction of access thrombosis but with a false positive rate of 60%, while the technique of prediction by the differences in pressure, dQa, had a sensitivity of 81% and a false positive rate of 50%. The high false-positive rates can lead to many unnecessary diagnostic and therapeutic procedures. Leon (2008) analysed the precision of physical examination, comparing it to angiography as standard test, in a study with 43 patients. For physical examination, they found a sensitivity of 57% and a specificity 89% for detecting *vein-graft anastomotic stenosis*, with a high degree of concordance between the two methods (kappa = 0.52). For the detection of *intragraft stenosis*, the sensitivity of the physical examination was 100% and specificity 73%; moderate concordance (kappa = 0.43). For the detection of *inflow* stenosis, the sensitivity of the physical examination was 33% and specificity 73%; moderate concordance (kappa = 0.40).	**Low quality**

Clinical benefit of screening compared to routine practice	
The Tonelli (2008) systematic review with meta-analysis included 6 randomised clinical trials that compared the active surveillance of the vascular access (using flow measurements or ultrasound) versus routine clinical monitoring. Only two of the studies used blind allocation and none of them were double blind.	
The Tonelli (2008) meta-analysis with data from six RCT and 446 patients found no statistically significant differences in the percentage of access **thrombosis** between surveillance with ultrasound and routine physical examination (relative risk 0.94; 95% CI: 0.77-1.16).	**Moderate quality**
With data from one RCT and 126 patients, there were no statistically significant differences in the **time to thrombosis** between the two monitoring options (hazard ratio 1.13; 95% CI: 0.71-1.80).	**Moderate quality**
The meta-analysis with data from four RCT and 381 patients showed no statistically significant differences between the two monitoring options in **loss of access** (hazard ratio 1.08; 95% CI: 0.83-1.40). The data from two RCT and 315 patients also showed no differences in the **time to loss of access** (hazard ratio 0.51; 95% CI: 0.15-1.74; high statistical heterogeneity I^2: 85%.	**Moderate quality**
One published RCT (Malik 2005) with 192 patients analysed the **duration of graft patency**, comparing patients monitored by ultrasound plus routine physical examination every three months and patients monitored by physical examination only. The publication does not provide data on randomisation method, blind allocation or blinding, and the study was not included in the above-mentioned reviews because it did not analyse clinically relevant effects such as thrombosis.	**Moderate quality**
The study showed longer duration of graft patency in the group of patients monitored by physical examination plus ultrasound, with differences significant after 12 months but not at 6 months. The relative risk of access failure was 3.75 (95% CI: 1.7-8.1) for the physical-examination-only group. The number of interventions per graft was higher in the ultrasound group, but the differences were not statistically significant.	**Low quality**
Summary of evidence	
There are no significant differences in the risk of thrombosis or graft loss in patients who have measurement of vascular access flow added as a method of surveillance. Active surveillance with ultrasound represents a greater use of healthcare resources.	**Moderate quality**
Patients' values and preferences *No relevant studies related to this aspect have been identified.*	

Use of resources and costs

The Tonelli (2008) review of RCT with meta-analysis shows that active surveillance with ultrasound is associated with increased use of percutaneous angioplasty and a lower risk of catheter insertions, with the differences not being significant in relation to the number of angiograms, surgical operations or hospitalisations.

There are no studies on the cost effectiveness or the budgetary impact that would potentially derive from widespread continuous and periodic use of active surveillance techniques in patients on haemodialysis via grafts in our setting.

Recommendations [Proposal]	
Strong	*We recommend routine clinical monitoring by means of physical examination in patients on haemodialysis via grafts.*
Strong	*We do not recommend the additional use of other active surveillance techniques in patients on haemodialysis via grafts.*

References

1. Tonelli M, James M, Wiebe N, Jindal K, Hemmelgarn B; Alberta Kidney Disease Network. Ultrasound monitoring to detect access stenosis in hemodialysis patients: a systematic review.Am J Kidney Dis. 2008 Apr; 51(4):630-40.
2. Casey ET, Murad MH, Rizvi AZ, Sidawy AN, McGrath MM, Elamin MB, Flynn DN, McCausland FR, Vo DH, El-Zoghby Z, Duncan AA, Tracz MJ, Erwin PJ, Montori VM. Surveillance of arteriovenous hemodialysis access: a systematic review and meta-analysis. J Vasc Surg. 2008 Nov; 48(5 Suppl):48S-54S.
3. Work J. Role of access surveillance and preemptive intervention. Semin Vasc Surg. 2011 Jun; 24(2):137-42.
4. Kumbar L, Karim J, Besarab A. Surveillance and monitoring of dialysis access. Int J Nephrol. 2012;
5. 2012:649735.Paulson WD, Moist L, Lok CE. Vascular access surveillance: an ongoing controversy. Kidney Int. 2012 Jan; 81(2):132-42.
6. Ram SJ, Nassar R, Work J et al. Risk of hemodialysis graft thrombosis: analysis of monthly flow surveillance. Am J Kidney Dis 2008; 52: 930–938.
7. Leon C, Orozco-Vargas LC, Krishnamurthy G, Choi KL, Mercado C, Merrill D, Thomas I, Salman L, Artikov S, Bourgoignie JJ, Asif A. Accuracy of physical examination in the detection of arteriovenous graft stenosis. Semin Dial. 2008 Jan-Feb; 21(1):85-8.
8. Malik J, Slavikova M, Svobodova J, Tuka V. Regular ultrasonographic screening significantly prolongs patency of PTFE grafts. Kidney Int 2005; 67: 1554-1558.

GRADE TABLES

Date: 2013-10-20
Question: Should ultrasound monitoring vs standard care be used for patients with haemodialysis with graft?
Settings: hospital
Bibliography: Tonelli M, James M, Wiebe N, Jindal K, Hemmelgarn B; Alberta Kidney Disease Network. Ultrasound monitoring to detect access stenosis in hemodialysis patients: a systematic review. Am J Kidney Dis. 2008 Apr; 51(4):630-40.

Quality assessment							No of patients		Effect		Quality	Importance
No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Ultrasound monitoring	Standard care	Relative (95% CI)	Absolute		
Thrombosis												
6	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	-	-	RR 0.94 (0.77 to 1.16)	-	⨁⨁⨁◯ MODERATE	CRITICAL
								0%		-		
Access loss												
4	randomised trials	serious	no serious inconsistency	no serious indirectness	no serious imprecision	none	-	-	HR 1.08 (0.83 to 1.4)	-	⨁⨁⨁◯ MODERATE	CRITICAL
								0%		-		
Number of percutaneous transluminal angioplasties												
5	randomised trials	serious	no serious inconsistency	no serious indirectness	no serious imprecision	none	-	-	RR 1.29 (1.04 to 1.60)	-	⨁⨁⨁◯ MODERATE	IMPORTANT
								0%		-		
Number of catheter insertions												
1	randomised	serious	no serious	no serious	no serious	none	-	-	RR 0.59	-	⨁⨁◯◯	IMPORTANT

	trials		inconsistency	indirectness	imprecision			0%	(0.37 to 0.93)	-	MODERATE	

[1] Allocation concealment only reported in two of the studies. None of the studies was double blinded.