

ANNEXES TO CHAPTER 5

**Clinical Question XX. Is there a treatment with better outcomes (percutaneous transluminal angioplasty versus surgery or prosthesis interposition) in non-matured arteriovenous fistula management, evaluated on arteriovenous fistula, which enables it to be used in dialysis, patency and/or thrombosis?**

It is estimated that 28-53% of arteriovenous fistulae do not mature enough for use in haemodialysis (Asif 2006). In general, a blood flow of 500 ml/min and diameter of at least 4 mm are needed for an AVF be adequate for dialysis. In successful fistulae, these parameters are met in 4 to 6 weeks. In other cases, we have to wait 4-6 months to conclude that the AVF has failed. Meanwhile, if dialysis is required, a tunnelled catheter has to be inserted, exposing the patient to the associated risks of morbidity and mortality.

Two factors, either alone or combined, tend to be responsible for the majority of cases of non-maturation of the AVF: vascular stenosis and the presence of a significant accessory vein (vein branch that comes off the main venous channel that comprises the AVF).

Both problems (stenosis and accessory veins) can be easily identified by adequate physical examination by an experienced healthcare professional, and therapeutic intervention planned once confirmed by angiography.

**Comparison between percutaneous angioplasty, surgery and interposition of prosthesis**

No RCT have been found comparing any two of these techniques.

<p>The study by Lee (2013) presented a retrospective comparison between 31 patients treated by <b>surgery</b> and 15 treated by <b>percutaneous angioplasty</b> and found <i>cumulative survival at one year after fistula creation</i> to be better for surgery patients (83%) than angioplasty patients (40%) (p=0.05).</p>	<p><b>Low quality</b></p>
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**Percutaneous angioplasty (clinical series)**

<p>A number of reviews (Falk 2011; Malovrh 2010; Chawla 2011; Saad 2010; Voormolen 2009) identify different clinical series which analysed the effectiveness and safety of percutaneous angioplasty in treating non-matured AVF and showed high rates of good outcomes. Table 1 shows the main results from 17 clinical series found. Data from the ten studies published up to 2007 are taken from the Falk review (2010), and data from the later ones have been taken from each study.</p> <p>The clinical outcomes of these studies were as follows:</p> <ul style="list-style-type: none"> <li>- Clinical success rate (AVF valid for haemodialysis); range: 47% to 97%.</li> <li>- Primary patency rate at one year; range: 28% to 71.9%.</li> <li>- Secondary patency rate at one year; range: 68% to 96.6%.</li> </ul>	<p><b>Low quality</b></p>
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<p>The systematic review by Voormolen (2009) that included articles published up to 2007, included 745 patients treated by a range of different techniques: 410 percutaneous angioplasty; 141 accessory veins; 90 embolisation of accessory vein; 90 accessory vein ligation (both percutaneous and by surgical incision); 15 surgery.</p>	<p><b>Low quality</b></p>
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<p>They analyse the outcomes of the interventions overall, but do not provide a breakdown for each technique.</p> <p>They found that, overall, 85.5% of treated patients (range 74-98%) were <i>able to use their AVF at least once for haemodialysis</i> after the treatment. Six articles reported average <i>primary patency at one year</i> of 51% (range 28-68%), and seven reported average secondary patency at one year of 76% (range 72-95%).</p> <p>Eight articles, including 508 patients, analysed the <i>complications</i> experienced by 47 patients (9.3%): 28 patients (5.5%) had haematomas at the puncture site or small amounts of leakage post-angioplasty without clinical sequelae; 11 patients (2.2%) had rupture of veins, which were treated by percutaneous transluminal angioplasty; five patients (1.0%) experienced <i>steal syndrome</i>; one patient developed pseudoaneurysm; one developed bacteraemia; and one lost the AVF after rupture of a vein.</p>	
<b>Summary of evidence</b>	
One retrospective study, with a small sample of patients, found better outcomes from surgery compared to angioplasty in terms of fistula survival at one year (AVF valid for haemodialysis).	<b>Low quality</b>
Numerous clinical series involving non-matured AVF treated by percutaneous angioplasty have found high rates of clinical success (AVF valid for haemodialysis) and secondary patency at one year.	<b>Low quality</b>
<b>Patients' values and preferences</b> <i>No relevant studies related to this aspect have been identified.</i>	
<b>Use of resources and costs</b> The study by Miller (2011) conducted in the USA estimated the cost of thrombectomy by percutaneous angioplasty (\$4881 to \$14,998) as less than the cost of creating a new vascular access, meaning savings could be made.	
<b>Recommendations [Proposal]</b>	
<b>Weak</b>	We recommend surgery or percutaneous angioplasty to treat the non-maturing fistula.
<b>References</b>	
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**Table 1. Clinical series of endovascular interventions in the non-maturing fistula**

Study	Number of AVF	Clinical success (valid for dialysis)	Primary patency rate at one year	Secondary patency rate at one year
Han 2013	141 stenosed	86.5 %	71.9 %	82.8%
Hsieh 2013	151 fistulae with occlusion or stenosis	94 %	51% (at 6 months)	90% (at 6 months)
Miller 2011	140 thrombosed fistulae	79 %	-	90% (at 12 months)
Natario 2010	30	97 %	37.3 %	96.6 %
Hong 2009	8	87.5 %	37.5 %	-
Turmel-Rodrigues 2009	74	97.3%	65% in arterial lesions 42% if concomitant stenosis	96 %
Manninen 2008	75	87 %	36 %	68 %
Clark 2007	101	88 %	34 %	75 %
Song 2006	22	96 %	28 %	85 %
Nassar 2006	118	83 %	62 %	93 %
Falk 2006	65	74 %	-	-
Shin 2005	19	74 %	61 %	82 %
Beathard 2003	100	92%	-	68 %
Tordoir 2003	17	47 %	-	-
Faiyez 2002	17	88 %	-	-
Turmel-Rodrigues 2001	69	97 %	39 %	79 %
Beathard 1999	63	82.5 %	-	75 %

**Table 2. STUDIES EXCLUDED**

Study	Cause for exclusion
Ascher 2009	Clinical series that has no data on clinical success or patency at one year
McLafferty 2009	Narrative review that does not address the treatment of non-maturing AVF
Wong 2012	Systematic review of the efficacy of duplex ultrasound scanning prior to the creation of the AVF
Smith 2012	Narrative review that does not address the treatment of non-maturing AVF
Veroux 2013	Clinical series on the efficacy of balloon angioplasty prior to the creation of the AVF
Jemcov 2013	Clinical series that does not address the treatment of non-maturing AVF

GRADE TABLES

Date: 2013-12-09

Question: Should percutaneous angioplasty be used in non-developed fistula?

Bibliography: Table 1

Quality assessment							No of patients		Effect		Quality	Importance
No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Percutaneous angioplasty	Control	Relative (95% CI)	Absolute		
<b>Clinical success (valid for dialysis) (Better indicated by lower values)</b>												
17	observational studies <sup>1</sup>	very serious <sup>1</sup>	no serious inconsistency	no serious indirectness	serious <sup>2</sup>	reporting bias <sup>3</sup>	0	-	-	-		CRITICAL
<b>Primary patency rate at one year (Better indicated by lower values)</b>												
17	observational studies <sup>1</sup>	very serious <sup>1</sup>	no serious inconsistency	no serious indirectness	serious <sup>2</sup>	reporting bias <sup>3</sup>	0	-	-	-		CRITICAL
<b>Secondary patency rate at one year (Better indicated by lower values)</b>												
17	observational studies <sup>1</sup>	very serious <sup>1</sup>	no serious inconsistency	no serious indirectness	serious <sup>2</sup>	reporting bias <sup>3</sup>	0	-	-	-		CRITICAL

<sup>1</sup> Case series

<sup>2</sup> Wide range of results: from 68% to 93%.

<sup>3</sup> It is likely that those who do not obtain good clinical outcomes do not publish the results.