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Clinical aspects of Arteriovenous Fistula use in a haemodialysis population

Results based on retrospective and interventional studies

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Anna Wärme

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Avhandlingen baseras på följande delarbeten

I. Hadimeri U, Wärme A, Stegmayr B. A single treatment, using Far Infrared light improves blood flow conditions in arteriovenous fistula. Clin Hemorheol Microcirc. 2017;66(3):211-217.

II. Wärme A, Hadimeri U, Hadimeri H, Nasic S, Stegmayr B. High doses of erythropoietin stimulating agents may be a risk factor for AV-fistula stenosis. Clin Hemorheol Microcirc. 2019;71(1):53-57.

III. Hadimeri U, Wärme A, Nasic S, Fransson SG, Wigelius A, Stegmayr B. Angiography and phlebography in a hemodialysis population: A retrospective analysis of interventional results. Int J Artif Organs. 2019 Dec;42(12):675-683.

IV. Wärme A, Hadimeri H, Nasic S, Stegmayr B. The association of erythropoietin-stimulating agents and increased risk for AV-fistula dysfunction in hemodialysis patients. A retrospective analysis. BMC Nephrology, 22 Article Number 30:(2021).

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Clinical aspects of Arteriovenous Fistula use in a haemodialysis population

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Anna Wärme

Department of Internal medicine and Clinical Nutrition, Institute of medicine, Sahlgrenska Academy, University of Gothenburg, Gothenburg, Sweden

ABSTRACT

When a patient suffers from end stage renal disease, the vascular access becomes the lifeline to perform regular haemodialysis (HD) treatment. The recommended first choice is the surgically created native Arterio-Venous Fistula (AVF). The AVF patency is limited due to stenosis, aneurysm and infections. The effect of access complications is uraemia progress, which jeopardizes patient survival. The overall aim of this thesis was to evaluate risk factors that cause AVF complications and to analyse interventions that might prevent AVF dysfunction.

Study I: This was a prospective study that included 30 patients with a native AVF in the forearm acting as his/her own control. Far Infrared illumination (FIR) is a non-recognized method used by few centres in an attempt to improve AVF flow. The primary aim was to evaluate the effect of one single treatment with FIR of the AVF. FIR increased the blood velocity of the AVF from 2.1 to 2.3 m/s ($p=0.02$). The diameter of the arterialized vein increased from 0.72 to 0.80 cm ($p=0.006$). The change in AVF blood velocity correlated with baseline serum urate ($p=0.004$), and the change in venous diameter correlated with the baseline plasma orosomucoid level ($p=0.005$).

Study II: The primary aim was to evaluate conditions that might lead to a dysfunctional AVF in a retrospective study comparing data from 66 patients in regular HD treatment (33 Cases with AVF dysfunction, 33 Controls without AVF dysfunction) during a two year follow-up. Cases had higher weekly doses of Erythropoiesis-Stimulating Agent (ESA), than Controls both before (mean 8312 U/w vs 4348, $p=0.005$) and after radiological AVF intervention/follow up (7656 vs 4477, $p=0.018$).

Study III: This was a retrospective study of patients (N=174) with clinically suspected dysfunction of the AVF. The primary aim was to evaluate to what extent the end-stage renal disease (ESRD) was related to a specific diagnosis and how radiological intervention affected the dysfunction of the AVF. AVF venous stenoses were the most frequent reason and were located mostly close to the anastomosis and to a lesser extent at the distal and proximal puncture sites. Arterial stenosis was significantly more frequent among patients with diabetic nephropathy ($p < 0.001$) and interstitial nephritis ($p < 0.001$).

Study IV: The primary aim was to uncover risk factors in HD patients that could explain the occurrence of AVF dysfunction. This was a retrospective analysis of 473 patients in HD from two hospitals. The main finding was a higher weekly dose of ESA among Cases with AVF dysfunction versus Controls without dysfunction (8000 IU vs 5000, $p<0.001$). In patients with diabetes mellitus, HbA1c was higher among Cases than Controls (50 vs 38 mmol/mol, $p<0.001$).

Conclusion: The AV Fistula patency among HD patients is limited due to various medical and surgical reasons. Besides radiological interventions, the need for other non-invasive treatment options such as FIR light may improve the maturation and patency of the AVF. To improve further AVF patency, strategies concerning patient selection, anaemia treatment and glycaemic control are future options for preventing AVF complications.

Keywords: Haemodialysis, AV Fistula, Far Infrared, Erythropoietin

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