

RESEARCH LETTER

Lower Cardiovascular Mortality Rates in Haemodialysis Patients with Radial Artery Based Fistulas

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Survival of patients undergoing chronic haemodialysis (HD) is limited, in part due to excessive cardiovascular mortality (CVM). Once HD is unavoidable, a radial artery based arteriovenous fistula (RA-AVF) is preferred in most cases. Because of ageing populations, increasing rates of diabetes mellitus and cardiovascular disease (CVD), RA-AVF construction may not always be viable as the access of first choice. Therefore, alternatives such as a more proximal AVF or arteriovenous graft (AVG) need to be considered as recommended by the ESVS guidelines.¹ One study in a heterogeneous group of HD patients with different types of AVF suggested inferior survival in brachial artery based AVF (BA-AVF) patients.² Although such a BA-AVF is optional in patients presenting with an unsuitable distal vasculature, it is largely unknown what impact type of AVF has on CVM. The present study sought to determine whether AVF location was independently related to CVM rates in a homogeneous HD population.

In this single centre retrospective cohort study, patients who received a primary BA-AVF or a primary RA-AVF between January 2010 and December 2017 were included. All patients were on chronic (> 3 months) and regular HD. The first access flow (Qa) that was obtained from a matured AVF using a dilutional technique was termed initial Qa. Stratification of initial Qa values occurred according to a proposed 1 000 mL/min threshold. Differences between groups with a BA-AVF or RA-AVF were analysed using Cox proportional hazard models with *a priori* defined potential confounders and depicted as Kaplan–Meier curves. Study protocol approval was provided by the institutional research committee.

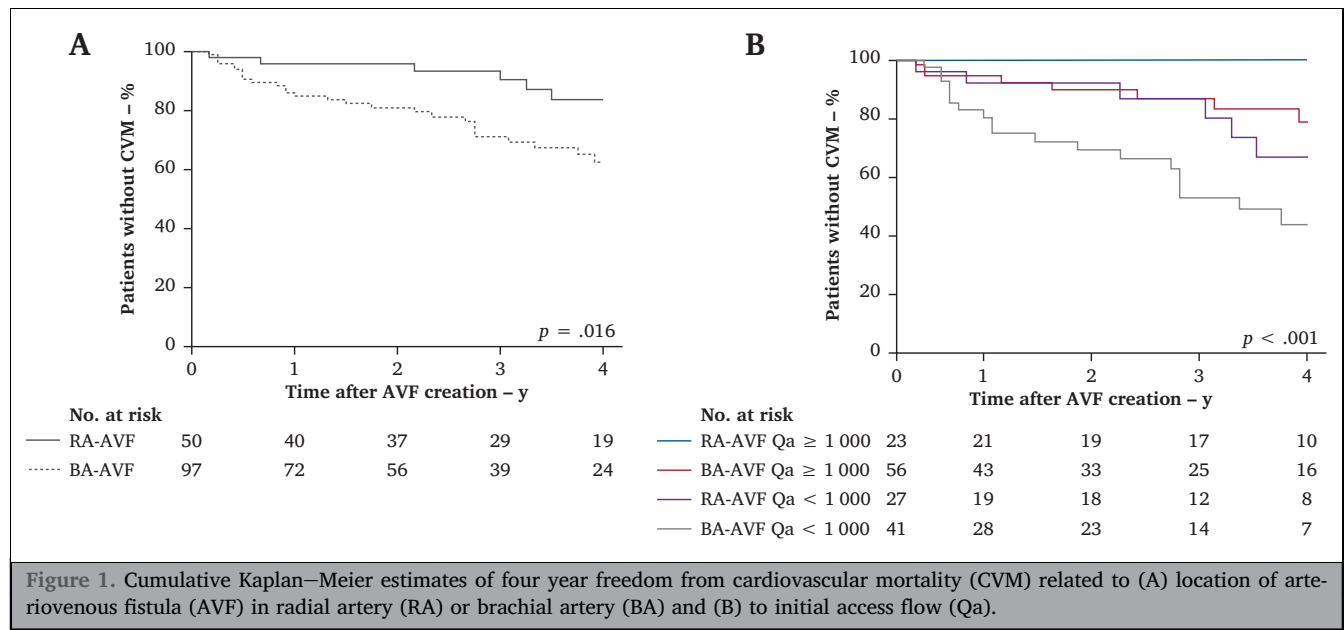
A total of 147 patients fulfilled study criteria (male $n = 97$; age 71 ± 12 year, BA-AVF $n = 97$, RA-AVF $n = 50$). During follow up (median, 42 months), 55 patients died (37%), of whom 60% were due to cardiovascular causes ($n = 33$). Demographics of the two AVF populations were similar regarding most parameters including age, diabetes, and history of cardiovascular disease or hypertension, although the RA-AVF group contained higher percentages

of males and fewer smokers. The relationship between AVF location and freedom from CVM is demonstrated in Fig. 1A. Four year freedom from CVM was 21% higher in RA-AVF patients (RA-AVF: $84 \pm 6\%$ vs. BA-AVF: $63 \pm 6\%$, $p = .016$). If the 1 000 mL/min threshold for initial Qa was considered, differences were even more pronounced (Fig. 1B). For instance, CVM after four years was zero in patients with a RA-AVF having an initial Qa $\geq 1 000$ mL/min compared with 57% in patients with a BA-AVF and an initial Qa < 1 000 mL/min. Multivariable analysis including predefined factors (age, sex, diabetes, cardiovascular disease, hypertension, smoking, initial Qa < 1 000 mL/min, and body surface area) demonstrated that BA-AVF patients sustained an almost three times higher risk of dying from a cardiovascular cause when compared with RA-AVF (HR 2.96, CI 1.16 – 7.59, $p = .024$).

Studies investigating CVM in HD populations with various types of accesses (central venous catheter CVC, AVG, AVF) consistently found superior survival rates in AVF populations. Therefore, efforts should be directed towards having an AVF ready for use once HD is required, ideally without the intervention of a temporary indwelling CVC. An AVF is more resistant to infections and sepsis compared with a CVC or AVG. However, an AVF can become harmful in the long term by exhausting the cardiovascular system.³ Results of the present study indicate that RA-AVF patients demonstrate superior survival rates compared with BA-AVF patients, independent of other risk factors. In addition, survival is better with an initial Qa $\geq 1 000$ mL/min, irrespective of distal or proximal AVF location.

One may speculate on the nature of the beneficial effects of a distal AVF location and a high initial Qa. A patient who qualifies for creation of a RA-AVF that matures well possibly has a healthier cardiovascular system with optimal remodelling qualities at the time of access construction compared with a patient requiring a BA-AVF. In addition, values of actual Qa of a RA-AVF are usually lower than BA-AVF potentially limiting chronic systemic overload with

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detrimental sequelae in the long term.⁴ Furthermore, systemic endothelial function may be less compromised in a RA-AVF due to lower vascular shear stress in the AVF arm than BA-AVF.⁵

Future guidelines should incorporate suggestions for increasing the likelihood of successful maturation of a distal AVF including advanced prediction models and avoiding catheterisation via the non-dominant radial artery in patients with poor renal function. Moreover, one might suggest exercising the forearms prior to access surgery to increase blood flow and vessel diameters facilitating more optimal RA-AVF construction and maturation.⁶

The findings of this study confirm the role of a RA-AVF as a preferential first choice access because of the low cardiovascular mortality rate in addition to preservation of more proximal vessels. AVF location and initial Qa may serve as additional prognostic markers in future prospective studies analysing long term survival in HD populations.

CONFLICTS OF INTEREST

None.

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