INTRODUCTION

Review question / Objective: Autogenous arteriovenous fistula (AVF) is a novel and efficient hemodialysis access for patients with end-stage renal disease (ESRD). The specific threshold of vein diameter still not reached a consensus. We aimed to explore the appropriate vein diameter threshold for satisfactory AVF functional maturation rate.

Condition being studied: Hemodialysis was one of the most essential treatment strategies for patients with end-stage renal disease (ESRD). Traditionally, central venous catheters (CVC) were constructed
for patients for long time regular hemodialysis. However, the incidence of thrombosis and infection were relatively high and the nursing work was also complicated, which led to development of alternative hemodialysis access used for maintenance hemodialysis. The National Kidney Foundation's Kidney Disease Outcomes Quality Initiative (KDOQI) had recommended that autogenous arteriovenous fistula (AVF) was most preferred, followed by arteriovenous fistula graft (AVG) and CVC in hemodialysis patients. In order to ensure the convenience of hemodialysis and the chance of re-intervention, the patient's non-dominant forearm was usually selected for the first-time operation. The most common surgery was forearm radiocephalic autologous arteriovenous fistula (RCAVF). The maturation rate of AVFs varied in a wide range in different studies and the previous systematic review estimated the pooled failure rate was 23%. The vascular condition, especially the vein diameter was one of the most important influencing factors. We usually used vein greater than 2mm for AVF in clinic, and the patency rate and maturation rate were content, which had reached consensus among vascular surgeons. However, vein lesser than 2mm was not a clearly contraindication for surgery, which required careful preoperative vascular examination and postoperative maintenance and follow-up. Patients with vein lesser than 2mm were advised to choose AVG or upper arm AVF, which might cause high incidences of complications such as graft infection, acute thrombosis, blood stealing syndrome, and heart failure or waste of forearm vascular resources respectively. The aim of this study was to compare the long-term outcomes of AVF with different diameter veins, and we expected to broaden the range of suitable vein diameters to provide more opportunities for ESRD patients with vein lesser than 2mm.

METHODS

Participant or population: The inclusion criteria were listed as follows: (1) articles were written in English; (2) study design was randomized controlled trial (RCTs) or observational study; (3) the AVF was constructed on upper limbs for hemodialysis in renal failure patients; (4) the AVF was constructed by autogenous veins; (5) the patients with different vein diameter were compared on outcome indicators such as functional maturation rate; (6) the threshold for patients grouping was 2mm.

Intervention: Vein less or more than 2mm for AVF creation.

Comparator: No.

Study designs to be included: Randomized controlled trial (RCTs) or observational study.

Eligibility criteria: (1) articles were written in English; (2) study design was randomized controlled trial (RCTs) or observational study; (3) the AVF was constructed on upper limbs for hemodialysis in renal failure patients; (4) the AVF was constructed by autogenous veins; (5) the patients with different vein diameter were compared on outcome indicators such as functional maturation rate; (6) the threshold for patients grouping was 2mm.

Information sources: We conducted a thoroughly search in the PubMed, Embase, and Web of Science databases for all relevant articles until July 15, 2022. The key words included “arteriovenous fistula”, “vein” and “diameter”. After removing duplicated articles, other additional items were sought by manual review the reference of all articles. We initially screened the articles mainly by the title and abstract, then we read the full text of all potentially eligible articles carefully.

Main outcome(s): According to the KDOQI clinical practice guideline for vascular access: 2019 update, the functional maturation was defined as a fistula became suitable for providing prescribed dialysis consistently with 2 needles, which was suggested to evaluate at 6 weeks postoperatively. The duration of time from
mature fistula to thrombosis or any intervention to facilitate, maintain, or re-establish patency (eg, angioplasty) was defined as the primary patency, while the duration of time from mature fistula to access abandonment was defined as cumulative patency (same as secondary patency).

**Quality assessment / Risk of bias analysis:** Newcastle–Ottawa scale (NOS) for cohort study.

**Strategy of data synthesis:** Categorical variables were presented by dividing the number of events by the number of cases. The bilateral $\chi^2$ test or Fisher's exact test was used for comparison. The continuous variables were shown as the mean ± standard deviation (SD) or median and range (quartile) and the t test or Mann–Whitney U test was used. Pooled odds ratio (OR) and 95% confidence intervals (CIs) were showed in forest plot. The heterogeneity was calculated by $I^2$, which represented the proportion of the difference caused by non-sampling error in the total heterogeneity. $I^2<50\%$ indicated low heterogeneity and the fixed effect model was the best choice while $I^2\geq 50\%$ indicated high heterogeneity and the random effect model was more appropriate. To clarify the potential source of heterogeneity, we performed sensitivity analysis by leave one-out approach to find studies design bias and confounding factors. The publication bias was evaluated by Egger's test. Subgroup analysis was conducted by gender and tourniquet using based on fix effect model. A $P$-value $< 0.05$ was considered statistically significant. All statistical analysis was conducted in R studio (version 4.2.0; https://www.r-project.org) with “meta” and “metafor” R packages.

**Subgroup analysis:** Yes.

**Sensitivity analysis:** Yes.

**Country(ies) involved:** China.

**Keywords:** small-caliber vein; arteriovenous fistula; functional maturation rate; end-stage renal disease.

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