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Research review

Stent graft placement versus angioplasty for hemodialysis access failure: a meta-analysis

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ABSTRACT

Background: Hemodialysis is a common treatment for end-stage renal disease, and maintenance of access patency remains a key issue. Angioplasty is recommended as the first choice for access stenosis, but it poses a risk of a high rate of restenosis. Stent graft placement can generate a high patency rate of dialysis access. This study aimed to compare the primary patency of the treatment area and access circuit between stent grafts and angioplasty in dialysis access failure.

Materials and methods: Three electronic databases, namely, PubMed, Cochrane Library of Systematic Reviews, and EMBASE, were searched from the database inception to September 2017 without language restriction. Randomized controlled trials comparing the primary patency of the treatment area and access circuit between stent graft and angioplasty were included. Two independent reviewers assessed the quality of the trials and extracted relevant data.

Results: Four trials satisfied our inclusion criteria. Our pooled results suggested that stent graft placement was associated with significantly higher primary patency of treatment area (hazard ratio: 0.65, 95% confidence interval: 0.55-0.77, $P < 0.0001$, $I^2 = 0$) and access circuit (hazard ratio: 0.76, 95% confidence interval: 0.65-0.88, $P = 0.0004$, $I^2 = 0$) in hemodialysis access compared with those of standard angioplasty.

Conclusions: The patency of hemodialysis access may be higher after stent graft placement combined with standard angioplasty than after angioplasty alone.

Introduction

In China, the prevalence of chronic kidney disease is approximately 13.0% (95% confidence interval [CI], 11.9-14.2), which is almost similar to the prevalence in the United States.[1] Such prevalence accounts for a large proportion of the population in China. With the occurrence of several problems related to renal transplantation, continuous renal replacement therapy is the optimal initial choice for patients who have reached end-stage renal disease.[2] Hemodialysis is more acceptable than peritoneal dialysis in terms of convenience, especially for young patients. However, the former

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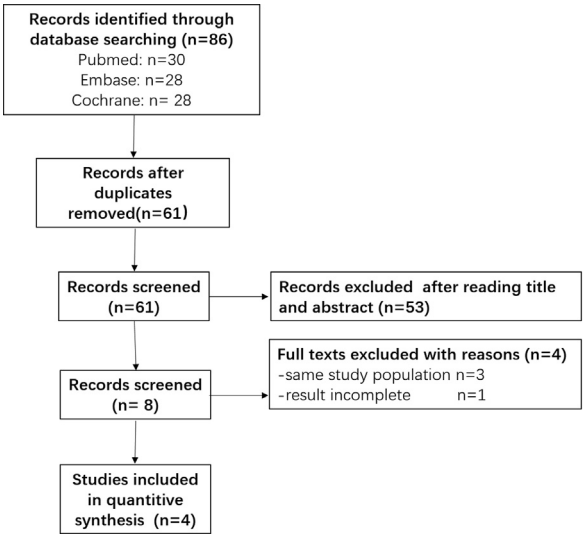

Fig. 1 – Article search strategy.

also causes some problems, such as stenosis or thrombosis in dialysis access, resulting in fatal consequences after hemodialysis.

Balloon angioplasty instead of surgical repair has emerged as the first-line therapy to maintain the patency of access. However, balloon angioplasty likely leads to restenosis and recoil because this procedure induces the formation of a new tunnel instead of the removal of lesion from the intima in the area of stenosis, depending on the cross-sectional force on vessel walls. Related primary patency rates range from 20% to 50% in 6 mo.[3-6]

Several studies published in the 1990s suggested that bare-metal stents cannot improve the patency of dialysis access.[7-9] Stent grafts have been widely used for vascular stenosis because of their material serving as an occlusive barrier to prevent intimal tissue hyperplasia. Surgeons aim to determine whether stent grafts can complement balloon angioplasty to maintain the patency of hemodialysis access. However, in 2010, Haskal *et al.*[5] compared the patency rates of dialysis access after stent grafts placement with those after standard angioplasty and found stent grafts placement combined with angioplasty help maintain the patency of dialysis access. Since then, a series of other randomized control trials (RCTs) has been reported.[6,10-12] Our meta-analysis was performed to compare the access circuit primary patency (ACPP) and treatment area primary patency (TAPP) of angioplasty with those of stent grafts placement for dialysis access failure and to summarize newly published level 1 evidence.

Methods

Data source and literature search

A literature search was conducted in the following databases from their inception to September 2017: PubMed, Cochrane, and EMBASE. Search terms were as follows: ("hemodialysis fistula" OR "hemodialysis access" OR "dialysis fistula "OR "dialysis access") AND ("stent" OR "stents") AND ("angioplasty" OR "endoluminal repair" OR "balloon") AND ("randomized controlled trial" OR "randomized" OR "placebo").

Study selection

Two reviewers independently assessed publications for inclusion in the review. Discrepancies were resolved through a discussion by the review team. Eligibility criteria were as follows: (1) treatment groups should include patients who underwent placement of stent grafts; (2) control groups should include patients who received angioplasty; and (3) baselines between control and treatment groups should be similar. Studies were excluded according to the following criteria: (1) case reports, case series, comments, reviews, and editorials; (2) studies unrelated to stent grafts placement for dialysis access failure; (3) studies only related to access restenosis or in-stent stenosis; and (4) studies without randomized design or control groups. When two or more papers regarding the same study were reported, only the one with a larger sample size was included.

Data extraction

Using a standardized form, two independent reviewers extracted details pertaining to participants, study design, enrollment period, sample size, inclusion and exclusion criteria of cases and controls, demographic data (age and gender) of cases and controls, mean ages of access, time point of follow-up, and types of stent grafts. Discrepancies were resolved through discussion.

Table 1 – Characteristics of included studies.

Source	Regions	Enrollment period	Number of patients	Sex (M/F)	Mean age (y, stent/angioplasty)	Follow-up interval
Vesely (2016)[6]	NA	September 2008 to May 2011	293	142/151	62 ± 13/61 ± 15	1, 3, 6, 12, 18, and 24 mo
Rajan (2015)[10]	United States and Canada	4 y	14	6/8	61	3, 6, and 12 mo
Haskal (2010)[5]	United States	NA	190	69/121	61.8 ± 14.6/59.8 ± 13.6	1, 3, 6, 12, 18, and 24 mo
Haskal (2016)[12]	United States	NA	270	97/183	63.2 ± 13.2/63.1 ± 12.3	30 d and 6, 12, 24 mo