

Drug-Eluting Versus Bare-Metal Stents for Symptomatic Intracranial Vertebral Artery (V4) Stenosis: A Single-Center Cohort Study

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Abstract

Background

Endovascular treatment is considered for selected patients with symptomatic intracranial atherosclerotic stenosis; however, evidence comparing drug-eluting stents (DES) and bare-metal stents (BMS) remains limited, particularly for vertebral artery V4 lesions.

Aim

To compare the safety and efficacy of DES and BMS in patients with symptomatic intracranial vertebral artery (V4) stenosis.

Methods

We retrospectively analyzed consecutive patients with symptomatic severe ($\geq 70\%$) intracranial vertebral artery stenosis treated with DES or BMS between January 2021 and June 2025 at a single tertiary center. The primary efficacy endpoint was in-stent restenosis (ISR) within 6 months. The primary safety endpoint was any stroke or death within 30 days. Firth penalized logistic regression was used to reduce small-sample bias.

Results

A total of 105 patients were included (DES, $n = 56$; BMS, $n = 49$). Baseline characteristics were well balanced. any ischemic stroke was significantly reduced in the DES group during follow-up, (5.66% vs 18.75%; OR 0.29, 95% CI 0.07–0.98; $P = 0.046$). The 6-month ISR rate was lower in the DES group compared with the BMS group (5.66% vs 16.70%; OR 0.33, 95% CI 0.08–1.15; $P = 0.083$). Thirty-day stroke or death occurred in 16.07% of DES patients and 6.12% of BMS patients (OR 2.66, 95% CI 0.79–11.18; $P = 0.119$).

Conclusions

In patients with symptomatic intracranial vertebral artery stenosis, DES and BMS demonstrated comparable perioperative safety. DES was associated with a significantly lower risk of follow-up ischemic stroke and a non-significant reduction in ISR, suggesting a potential clinical advantage in this high-risk anatomical subgroup.

Introduction

Intracranial atherosclerotic disease (ICAS) is a major cause of ischemic stroke worldwide and remains a leading etiologic subtype in Asian populations, accounting for approximately 30%–50% of all ischemic strokes [1, 2]. The intracranial segment of the vertebral artery (V4) represents a unique anatomical and hemodynamic environment characterized by vessel curvature, diameter variation, and complex flow patterns. These features contribute to an increased susceptibility to atherosclerotic plaque formation and progression [1, 3]. Data from the New England Medical Center Posterior Circulation Registry (NEMC) have demonstrated that intracranial vertebral artery stenosis (> 50%) is present in approximately one-third of patients with posterior circulation ischemic events, underscoring its clinical relevance [4]. Importantly, lesions in this location have been associated with higher risks of early stroke recurrence and mortality compared with other intracranial vascular territories [5, 6].

Although aggressive medical therapy remains the cornerstone of treatment for ICAS, patients with high-grade symptomatic stenosis continue to experience recurrent ischemic events despite optimal pharmacologic management [2, 7]. This therapeutic gap has prompted interest in endovascular intervention as a potential strategy for selected high-risk patients.

However, early randomized controlled trials, including SAMMPRIS and VISSIT, reported elevated perioperative complication rates associated with intracranial stenting, leading to a significant decline in its routine use [8–10]. More recent studies, including the CASSISS trial and contemporary registry data, suggest that with improved patient selection, perioperative management, and device technology, endovascular treatment may achieve more favorable safety profiles [11, 12].

Within this evolving therapeutic landscape, in-stent restenosis (ISR) remains a critical limitation affecting long-term outcomes after intracranial stenting. ISR is primarily driven by neointimal hyperplasia and vascular smooth muscle proliferation following endothelial injury [13, 14]. Drug-eluting stents (DES), which release antiproliferative agents such as sirolimus or paclitaxel, have been shown to reduce neointimal formation and restenosis in coronary and peripheral arteries, and emerging evidence suggests similar biological effects in intracranial circulation [13, 15].

Nevertheless, most existing studies evaluating DES versus bare-metal stents (BMS) have been conducted in heterogeneous intracranial vascular territories [13, 15–17], without specific stratification of vertebral artery V4 lesions. Given the distinct anatomical and hemodynamic characteristics of the V4 segment, the generalizability of prior findings to this subgroup remains uncertain.

Therefore, we conducted a single-center retrospective cohort study to compare the safety and efficacy of drug-eluting stents versus bare-metal stents in patients with symptomatic intracranial vertebral artery (V4) stenosis, with a particular focus on in-stent restenosis and ischemic outcomes.

Method

Patients

This single-center retrospective cohort study included consecutive patients who underwent endovascular stenting for symptomatic intracranial vertebral artery (V4) stenosis at our institution between January 2021 and June 2025. Patients were classified into the drug-eluting stent (DES) group and the bare-metal stent (BMS) group according to the implanted device.

Eligibility criteria were as follows: (1) age ≥ 18 years; (2) angiographically confirmed intracranial vertebral artery (V4) stenosis of $\geq 70\%$, assessed by digital subtraction angiography (DSA) according to the Warfarin-Aspirin Symptomatic Intracranial Disease (WASID) criteria [18], with subsequent stent implantation and at least 6 months of clinical follow-up; (3) a history of transient ischemic attack (TIA) or non-disabling ischemic stroke within 6 months prior to enrollment attributable to the target vessel, despite standard medical therapy, including single or dual antiplatelet therapy and statin treatment; and (4) the presence of at least one atherosclerotic risk factor, including hypertension, diabetes mellitus, hyperlipidemia, hyperhomocysteinemia, or current smoking.

Patients were excluded if they met any of the following criteria: (1) non-atherosclerotic stenosis, such as arterial dissection or fibromuscular dysplasia; (2) concurrent $\geq 70\%$ stenosis in other intracranial or extracranial vessels; (3) prior surgical or endovascular intervention in the ipsilateral vertebral artery; or (4) known allergy to iodinated contrast agents.

Procedure

All patients received dual antiplatelet therapy consisting of aspirin (100 mg/day) and clopidogrel (75 mg/day) for at least 3 days prior to the procedure. In patients scheduled for urgent intervention who had not previously received clopidogrel, a loading dose of 300 mg was administered.

Procedures were performed under general or local anesthesia. Vascular access was obtained via either the radial or femoral artery. Intravenous heparin was administered during the procedure to maintain an activated clotting time (ACT) of 250–300 seconds. All patients underwent diagnostic digital subtraction angiography (DSA) of the aortic arch and intracranial circulation prior to intervention, followed by catheter-based endovascular revascularization.

A microguidewire was navigated across the stenotic lesion in the intracranial vertebral artery (V4 segment). Drug-eluting stents (DES), including sirolimus-eluting stents (e.g., Maurora stent, Alain Medical, Beijing, China; Bridge stent, Shanghai MicroPort NeuroTech, Shanghai, China), or balloon-expandable bare-metal stents (BMS), including Carbofilm-coated stents (Alvi Medical, Italy), Trump stent, or Apollo stent (MicroPort Medical, Shanghai, China), were deployed according to operator preference and lesion characteristics. No distal embolic protection devices were used in any case.

Technical success was defined as successful stent deployment with residual stenosis of less than 30% on final angiography. All procedures were performed by a single experienced neurointerventionalist.

Follow-up and Outcomes

All patients in both the DES and BMS groups received dual antiplatelet therapy consisting of aspirin (100 mg/day) and clopidogrel (75 mg/day) for 180 days after stent implantation. Thereafter, patients were transitioned to single antiplatelet therapy with either aspirin or clopidogrel at the discretion of the treating physician.

Clinical follow-up was conducted by experienced neurologists through outpatient visits at 1, 3, 6, 12, and 18 months after the procedure, and annually thereafter. Each follow-up visit included a structured neurological assessment and routine laboratory testing, including complete blood count, liver function, and renal function. In cases of suspected clinical events, computed tomography angiography (CTA) or digital subtraction angiography (DSA) was performed. In the absence of clinical events, vascular imaging (CTA or DSA) was routinely performed at 6 months after stenting.

The primary efficacy endpoint was in-stent restenosis (ISR) within 6 months after the procedure. ISR was defined as $\geq 50\%$ luminal diameter stenosis occurring within the stent or within 5 mm adjacent to the stent edges. The primary safety endpoint was any stroke or death within 30 days after the procedure. Secondary efficacy endpoints included technical success (defined as residual stenosis $< 30\%$ on final angiography), symptomatic ISR (defined as ischemic events attributable to the target vessel territory in the presence of ISR), and any stroke occurring between 31 days and 6 months after the procedure, including ischemic stroke in the target vascular territory, ischemic stroke in other vascular territories, and any intracranial hemorrhage. All-cause mortality between 31 days and 6 months was also recorded. Secondary safety endpoints included perioperative vascular complications, defined as intra-procedural vasospasm, arterial dissection, access-site hematoma, or procedure-related hemorrhage.

Statistical Analysis

Continuous variables were summarized as mean $\pm$ standard deviation or median with interquartile range, as appropriate. Between-group comparisons were performed using the independent samples t-test or the Mann–Whitney U test, depending on data distribution. Categorical variables were presented as counts (percentages) and compared using the chi-square test or Fisher's exact test, as appropriate.

Given the relatively small sample size and low event frequency, Firth's penalized logistic regression was applied to reduce small-sample bias and to obtain more robust effect estimates [19]. Odds ratios (ORs) and corresponding 95% confidence intervals (CIs) were reported. Although some outcomes exhibited relatively higher event rates, Firth's penalized likelihood approach was consistently used across all regression models to ensure methodological uniformity and to minimize potential small-sample estimation bias.

Multivariable analyses were conducted using a restricted covariate strategy. Each model included a maximum of two variables: stent type (DES vs BMS) and one prespecified confounder. Prespecified confounders were selected a priori based on clinical relevance and previous literature [20], including age

(≥ 65 vs < 65 years) and preoperative stenosis severity (≥ 80% vs < 80%). Separate models were constructed for the primary efficacy outcome (ISR) to evaluate the robustness of associations after adjustment for individual confounders. Given the limited sample size, missing data were not imputed, and a complete-case analysis approach was adopted.

All statistical tests were two-sided, and a P value < 0.05 was considered statistically significant. Statistical analyses were performed using R software (version 3.6.0; Firth regression implemented via the logistf package) and SPSS version 27.0.

Results

Baseline Characteristics

A total of 105 patients were included in the analysis, with 56 patients in the drug-eluting stent (DES) group and 49 patients in the bare-metal stent (BMS) group. The mean age was 65.14 years in the DES group and 65.00 years in the BMS group. Male patients accounted for 75.0% (42/56) and 69.4% (34/49) in the DES and BMS groups, respectively. No statistically significant differences were observed in baseline demographic characteristics between the two groups (all P > 0.05; Table 1).

Table1 Baseline characteristics of patients in both groups

	DES N=56	BMS N=49	<i>P</i>
General characteristics			
Age, years	65.1±8.0	65.0±9.28	0.93
Male sex, n (%)	42±75.0	34±69.4	0.52
Stroke within 30 days, n (%)	35±62.5	37±75.5	0.15
Hypertension, n (%)	47±83.9	41±83.7	0.97
Diabetes mellitus, n (%)	39±69.6	40±81.6	0.16
Hyperlipidemia, n (%)	49±87.5	43±87.8	0.97
Hyperhomocysteinemia, n (%)	26±46.4	19±38.8	0.43
Body mass index, median (IQR)	23.8±21.7-26.9	25.3±21.9-27.7	0.29
Renal insufficiency, n (%)	5±8.9	4±8.2	0.89
Coronary artery disease, n (%)	16±28.6	18±36.7	0.37
Cerebrovascular disease, n (%)	23±41.1	19±38.8	0.81
Smoking status, n (%)			0.56
Current smoker	24±42.9	18±36.7	
Former smoker	8±14.3	5±10.2	
Never smoker	24±42.9	26±53.1	
HbA1c, %, median (IQR)	6.75±5.9-7.9	7.30±6.4-8.8	0.09
LDL, mmol/L, median (IQR)	2.55±1.9-3.3	2.65±1.7-3.1	0.74
Preprocedural stenosis degree, %, median (IQR)	80±75-90	80±75-90	0.74
Contralateral vertebral artery/basilar artery stenosis, n (%)	36±64.3	32±65.3	0.91
Baseline mRS, median (IQR)	1±0-2	1±0-2	0.48

HbA1c, Glycated hemoglobin; LDL, Low-density lipoprotein cholesterol; mRS, modified Rankin Scale score;

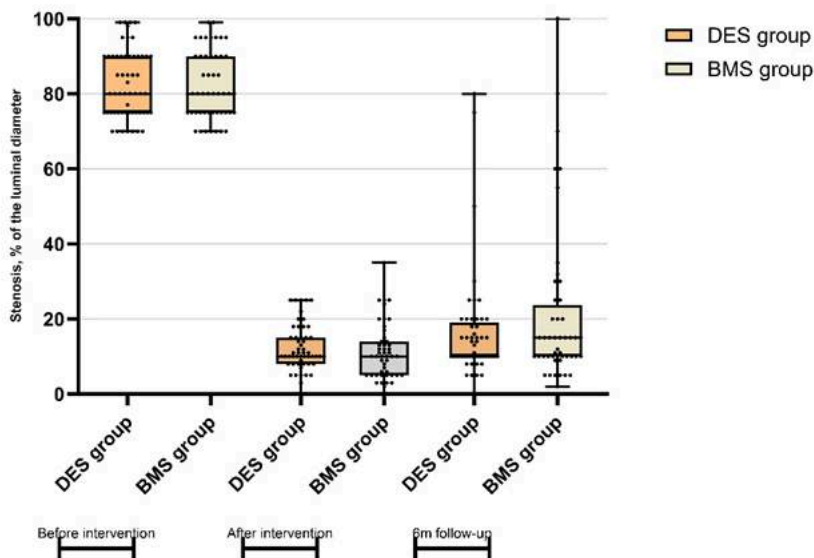
Procedural and Angiographic Outcomes

In the drug-eluting stent (DES) group, the implanted stent types included Bridge stents (n = 34) and Maurora stents (n = 22). In the bare-metal stent (BMS) group, Trump stents (n = 20) and APOLLO stents

(n = 29) were used. All stents were balloon-expandable devices. Intra-procedurally, one patient in each group exhibited residual stenosis >30% after stent deployment. In both cases, adjunctive post-dilation with an intracranial balloon was performed, resulting in residual stenosis <30% on final angiography. No significant differences were observed in other procedural characteristics between the two groups (Supplementary Table 1).

Changes in luminal stenosis at baseline and immediately after stenting are presented in Figure 1, with no significant intergroup differences observed. At 6-month follow-up, vascular imaging was available for 101 patients (DES group, n = 53; BMS group, n = 48), including digital subtraction angiography (DSA) in 91 patients and computed tomography angiography (CTA) in 10 patients. The degree of residual stenosis at follow-up was lower in the DES group compared with the BMS group; however, the difference did not reach statistical significance (median [IQR]: 10% [10%–18%] vs 15% [10%–24%], P = 0.291).

Figure 1. Stenosis Percentage of the Luminal Diameter in the Drug-Eluting Stent (DES) and Bare-Metal Stent (BMS) Groups.



The stenosis percentage of the 2 groups was similar at baseline and immediately after stent placement. At the 6-month follow-up, there was no statistically significant difference in the median degree of stenosis between the DES group and the BMS group. The horizontal bar within the boxes indicates the median; upper and lower ends of the boxes, the interquartile range; and whiskers, the maximum and minimum values.

Safety and Efficacy Outcomes

The overall rate of stroke or death within 30 days after the procedure was 11.43% in the entire cohort. This rate was 16.07% in the drug-eluting stent (DES) group and 6.12% in the bare-metal stent (BMS) group, with no statistically significant difference between groups (OR 2.36; 95% CI, 0.68–9.21; P = 0.17).

Intracranial hemorrhagic complications occurred in the DES group, including two cases of intra-procedural subarachnoid hemorrhage (one of which was fatal) and one case of asymptomatic thalamic hemorrhage detected postoperatively. In the BMS group, one patient experienced a fatal ischemic stroke.

Although intra-procedural hemorrhagic events were more frequent in the DES group compared with the BMS group, this difference did not reach statistical significance (OR 5.01; 95% CI, 0.45–78.20; $P = 0.18$).

No significant differences were observed between the two groups in other procedure-related complications (Table 2).

Table 2. Safety Endpoints

Within 30 days	No. (%)		Firth OR (95%CI)	<i>P</i>
	DES	BMS		
	N=56	N=49		
Primary endpoints				
Any stroke or death	9 (16.07%)	3 (6.12%)	2.66 (0.79-11.18)	0.119
Ischemic stroke	6 (10.71%)	3 (6.12%)	1.71 (0.46-7.54)	0.431
In target vessel territory	4 (7.14%)	1 (2.04%)	2.77 (0.49-28.36)	0.260
In other vessel territory	2 (3.57%)	2 (4.08%)	0.87 (0.13-5.84)	0.881
ICH,SAH, or IVH	2 (3.57%)	1 (2.04%)	1.48 (0.19-16.62)	0.704
Secondary endpoints				
Intra-procedural vasospasm	1 (1.79%)	1 (2.04%)	0.87 (0.07-11.03)	0.908
Intra-procedura arterial dissection	0 (0.00%)	3 (6.12%)	0.12 (0.00-1.26)	0.081
Intra-procedural hemorrhage	2 (5.36%)	1 (0.00%)	5.01 (0.45-78.2)	0.18
Access site hematoma	2 (3.57%)	3 (6.12%)	0.61 (0.10-3.27)	0.558

Abbreviations: BMS, bare-metal stent; DES, drug-eluting stent; ICH, intracerebral hemorrhage; IVH, intraventricular hemorrhage; OR, odd ratio; SAH, subarachnoid hemorrhage

Excluding two perioperative deaths, a total of 103 patients were eligible for follow-up. Among them, one patient in the drug-eluting stent (DES) group was lost to follow-up, and one additional patient was excluded due to inadequate imaging quality. Ultimately, 101 patients were included in the final analysis (DES, $n = 53$; BMS, $n = 48$). The median follow-up duration was 7.0 months in the DES group and 7.8 months in the BMS group. Technical success rates exceeded 90% in both groups, with no statistically significant difference observed between them.

At 6-month follow-up, the risk of in-stent restenosis (ISR) was lower in the DES group compared with the BMS group (5.66% vs 12.50%; OR 0.48; 95% CI, 0.11–2.05; $P = 0.32$), although the difference did not reach statistical significance. Notably, none of the ISR cases in the DES group were symptomatic, whereas 50% of ISR cases in the BMS group were associated with clinical symptoms.

During follow-up, three patients in the DES group and nine patients in the BMS group experienced ischemic stroke. The incidence of any stroke was significantly lower in the DES group compared with the BMS group (5.66% vs 18.75%; OR 0.29; 95% CI, 0.07–0.98; $P = 0.046$).

No intracranial hemorrhagic events were observed in either group during the follow-up period (Table 3).

Table 3. Efficacy Endpoints

	No. (%)		Firth OR (95%CI)	P
	DES	BMS		
	N=53	N=48		
Primary endpoint				
ISR within 6 months	3 (5.66%)	8 (16.70%)	0.33 (0.08-1.15)	0.083
Secondary endpoints				
Technical success, n (%)	55 (98.20%) ^a	46 (93.90%) ^b	0.36 (0.03-2.27)	0.282
Symptomatic ISR	0 (0.00%)	3 (6.25%)	0.12 (0.00-1.30)	0.087
Any stroke (31 days to 6 months)	3 (5.66%)	9 (18.75%)	0.29 (0.07-0.98)	0.046
Infarction in target vessel territory	1 (1.89%)	5 (10.42%)	0.23 (0.02-1.19)	0.082
Infarction in non-target territory	3 (3.77%)	4 (8.33%)	0.48 (0.08-2.28)	0.357
All-cause death (31 days to 6 months)	1 (1.89%)	1 (2.08%)	0.90 (0.07-11.43)	0.932

^a n=56. ^b n=49.

Multivariable Analysis

In multivariable Firth logistic regression analyses of the primary endpoint (6-month in-stent restenosis), drug-eluting stents (DES) consistently demonstrated a trend toward reduced risk of ISR compared with bare-metal stents (BMS) after adjustment for potential confounders; however, none of these associations reached statistical significance. Separate models were constructed adjusting for age (≥ 65 vs < 65 years) and preoperative stenosis severity ($\geq 80\%$ vs $< 80\%$), respectively (Supplementary Table 2).

Supplement table 1 Comparison of Procedural Characteristics Between the Two Groups

	DES N=56	BMS N=49	<i>P</i>
Left vertebral artery involvement, n (%)	36 (64.3)	30 (61.2)	0.75
Femoral artery access, n (%)	33 (58.9)	35 (71.4)	0.18
Tortuosity of treated vertebral artery, n (%)	20 (35.7)	11 (22.4)	0.14
Technical success, n (%)	55 (98.2)	46 (93.9)	0.34
Stent diameter, mm, median (IQR)	3.5 (3.0-4.0)	3.5 (2.5-4.0)	0.36
Stent length, mm, median (IQR)	13 (13.0-15.0)	15 (12.5-16.0)	0.09
Balloon pre-dilation, n (%)	26 (46.4)	27 (55.1)	0.38
Pre-dilation pressure, atm, median (IQR)	10 (8-12)	10 (8-12)	0.49

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Supplement table 2 Multivariate Analysis of ISR

Variable	Unadjusted OR (95%CI)	Unadjusted <i>P</i>	Adjusted OR (95%CI)	Adjusted <i>P</i>
Stent group	0.33 (0.08-1.15)	0.083	0.34 (0.09-1.26)	0.105
Age (≥65 years vs <65 years)	0.76 (0.22-2.65)	0.652	0.9 (0.25-3.15)	0.863
Preprocedural stenosis degree (≥80% vs <80%)	0.33 (0.09-1.13)	0.078	0.34 (0.1-1.21)	0.096

Discussion

In this single-center retrospective cohort study, we compared the safety and efficacy of drug-eluting stents (DES) and bare-metal stents (BMS) in patients with symptomatic intracranial vertebral artery (V4) stenosis. The principal findings were threefold. First, patients treated with DES experienced a significantly lower incidence of ischemic stroke during follow-up. Second, DES was associated with a lower rate of in-stent restenosis (ISR) at 6 months, although the difference did not reach statistical significance. Third, the overall perioperative safety profiles of DES and BMS were comparable, although numerically higher rates of early complications were observed in the DES group. These findings are relevant because evidence focusing specifically on intracranial vertebral artery (V4) lesions remains limited.

The biological rationale for DES is well established. Neointimal hyperplasia resulting from vascular smooth muscle cell proliferation is considered the principal mechanism underlying ISR following stent implantation [13, 14]. By locally releasing antiproliferative agents, DES can inhibit neointimal growth and reduce luminal restenosis. While this mechanism has been extensively validated in coronary interventions, emerging evidence suggests that similar benefits may extend to intracranial vessels [15, 17]. However, intracranial arteries exhibit fundamental differences from coronary arteries in terms of pathological structure and hemodynamic characteristics [21, 22]. Consequently, the benefit mechanism of DES in the intracranial vasculature may not be entirely equivalent to that observed in the coronary circulation. This distinction is particularly pronounced in the V4 segment of the vertebral artery.

Interestingly, the reduction in recurrent ischemic stroke appeared to be more pronounced than the reduction in angiographic restenosis. This finding suggests that the clinical benefit of DES may not be solely mediated through ISR prevention. The V4 segment is characterized by complex hemodynamics and a high density of perforating branches, where recurrent ischemic events may result not only from luminal restenosis but also from thromboembolic mechanisms, perforator compromise, and local hemodynamic disturbances [23, 24]. In addition, Sirolimus-eluting stents may exert favorable effects on local inflammatory responses [25], potentially reducing ischemic risk independent of angiographic restenosis. Therefore, ISR is only a surrogate endpoint, while stroke is the true clinical endpoint.

Although the reduction in ISR did not reach statistical significance, the observed odds ratio (0.33) and the absolute risk reduction were highly consistent with previous randomized trials evaluating intracranial sirolimus-eluting stents [15-17]. Several factors may explain the lack of statistical significance in our cohort. First, unlike previous studies that included mixed ICAS locations, our study exclusively focused on V4 lesions, which represent a distinct anatomical and hemodynamic subset. Second, the ISR rate in the BMS group was substantially lower than that reported in prior trials [17, 26], likely reflecting improvements in contemporary balloon-expandable stent technology and patient selection. Third, the number of restenosis events was limited.

An additional finding of clinical importance was the significantly lower rate of follow-up ischemic stroke observed in the DES group. Although the relationship between ISR and recurrent stroke is complex, several studies have identified ISR as an important contributor to late ischemic events following intracranial stenting [17, 27, 28]. Notably, no ischemic stroke attributable to ISR was observed in the DES group, whereas ISR-related ischemic stroke accounted for a substantial proportion of recurrent events in the BMS group. These findings suggest that the potential clinical benefit of DES may extend beyond angiographic restenosis reduction and translate into improved long-term cerebrovascular outcomes.

Despite the potential long-term advantages of DES, perioperative safety remains an important consideration. In our cohort, procedure-related complications occurred more frequently in the DES group than in the BMS group, although the differences were not statistically significant. Similar observations have been reported in previous studies evaluating intracranial DES [17]. Because of the low number of events and limited statistical power, these findings should be interpreted cautiously. Nevertheless, they

underscore the importance of meticulous patient selection, procedural planning, and perioperative management when considering intracranial stenting.

Limitations

Several limitations should be acknowledged. First, this was a retrospective single-center study and is therefore susceptible to selection bias, information bias, and residual confounding. The choice of DES or BMS was determined by treating physicians rather than random allocation, and unmeasured factors such as lesion morphology, vessel tortuosity, operator preference, and socioeconomic considerations may have influenced treatment selection. Second, the relatively small sample size limited statistical power and increased the risk of type II error. Although Firth penalized logistic regression was used to mitigate small-sample bias, the possibility of unstable estimates cannot be excluded. Third, different stent platforms were included within each treatment category, potentially introducing device-related heterogeneity. Finally, follow-up duration was relatively short, and approximately 10% of vascular imaging assessments were performed using CTA rather than DSA, which may have reduced the sensitivity for detecting ISR.

Conclusion

Among patients with symptomatic intracranial vertebral artery stenosis, DES demonstrated comparable perioperative safety to BMS and was associated with a lower incidence of follow-up ischemic stroke, together with a consistent reduction in ISR. Although the reduction in restenosis did not reach statistical significance, the magnitude and direction of effect suggest a potential advantage of DES in this anatomically distinct subgroup. Larger multicenter prospective studies are warranted to validate these findings and to further define the role of DES in the treatment of posterior circulation intracranial atherosclerotic disease.

Declarations

Contributors

FH was responsible for study design and drafting of the manuscript. ZZ contributed to manuscript revision. DH, MW, XS collected the data and reviewed the imaging. JZ prepared the figures. All authors reviewed and approved the final version of the manuscript. ZZ is the guarantor.

Conflict of Interest

The authors declare that they have no conflict of interest.

Author Contribution

FH was responsible for study design and drafting of the manuscript. ZZ contributed to manuscript revision. DH,MW, XS collected the data and reviewed the imaging. JZ prepared the figures. All authors reviewed and approved the final version of the manuscript. ZZ is the guarantor.

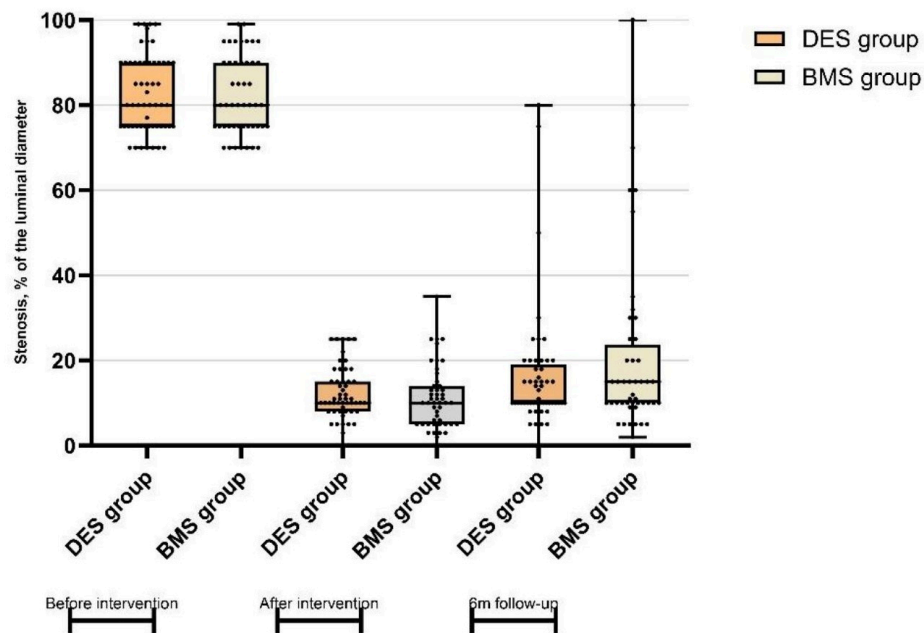
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Figures

Figure 1. Stenosis Percentage of the Luminal Diameter in the Drug-Eluting Stent (DES) and Bare-Metal Stent (BMS) Groups.



The stenosis percentage of the 2 groups was similar at baseline and immediately after stent placement. At the 6-month follow-up, there was no statistically significant difference in the median degree of stenosis between the DES group and the BMS group. The horizontal bar within the boxes indicates the median; upper and lower ends of the boxes, the interquartile range; and whiskers, the maximum and minimum values.

Figure 1

See image above for figure legend.

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