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Viatorr versus WallFlex stents in TIPS: A single-centre South African study

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Background: Transjugular intrahepatic portosystemic shunt (TIPS) procedures are vital in managing complications of portal hypertension. The Viatorr stent is the standard for TIPS, but availability constraints often necessitate the use of alternatives such as WallFlex. Comparative data on their outcomes are limited.

Objectives: This study aimed to compare 12-month clinical outcomes of WallFlex and Viatorr stents in patients undergoing TIPS creation at a single tertiary centre.

Method: A retrospective review of 83 adult patients who underwent TIPS placement between June 2018 and November 2023 was performed. Forty patients received WallFlex stents (June 2018 – October 2020) and 43 received Viatorr stents (November 2020 – November 2023). Baseline clinical parameters, procedural data and outcomes were analysed. The primary outcome was the need for TIPS revision within 12 months; secondary outcomes included post-TIPS complications, hepatic encephalopathy, liver transplantation and mortality.

Results: Baseline characteristics were comparable. There were no significant differences between WallFlex and Viatorr stents for TIPS revision, complications, hepatic encephalopathy, transplantation or mortality. At 12 months, TIPS revision rates were 28% for WallFlex and 35% for Viatorr ($p = 0.79$). Complications occurred in 80% and 60% of patients, respectively; hepatic encephalopathy in 20% versus 21%; transplantation in 38% versus 26%; and mortality in 38% versus 21% ($p > 0.05$).

Conclusion: WallFlex and Viatorr stents demonstrated comparable 12-month outcomes in TIPS procedures. WallFlex represents a clinically acceptable alternative in resource-constrained settings.

Contribution: This study provides the first local comparative data on WallFlex and Viatorr stents for TIPS in South Africa, highlighting WallFlex as a viable alternative where Viatorr availability is limited.

Keywords: transjugular intrahepatic portosystemic shunt; WallFlex; Viatorr; portal hypertension; interventional radiology.

Introduction

Transjugular intrahepatic portosystemic shunt (TIPS) is a minimally invasive procedure that is becoming increasingly important as a treatment alternative in both the management of portal hypertension and its associated complications.[1] The burden of liver disease in sub-Saharan Africa is substantial and rapidly growing.[2] Cirrhosis is the leading cause of portal hypertension, with alcohol, hepatitis B and C and HIV co-infection contributing to high morbidity and mortality.[2] Complications such as gastrointestinal bleeding, hepatic hydrothorax, encephalopathy and refractory ascites carry significant risk. Although liver transplantation and medical therapies exist, TIPS remains a critical therapeutic option.[1,3]

Transjugular intrahepatic portosystemic shunt procedures were originally conceptualised almost 40 years ago as a rescue therapy for patients with intractable variceal bleeding.[4] Over the years, it has been demonstrated that this minimally invasive procedure is associated with a substantial reduction in portal pressures and, as such, continues to be a main focus in clinical research.[4] During the earlier stages of TIPS use, the most critical issue was poor long-term patency of the stents and an increased incidence of hepatic encephalopathy.[4]

Once TIPS procedures became more widely adopted, a self-expandable Wallstent endoprosthesis (Boston Scientific, Natick, MS) was used for most of the procedures and became the first Food and

Drug Administration (FDA)-approved TIPS stent in 2005.[5] This was the preferred device because of its flexibility, range of diameters and relative ease of use; however, it was prone to the development of thick pseudo-intimal hyperplasia which was directly associated with poor patency rates.[5]

As poor stent patency continued to complicate the TIPS procedure, the need for the development of better stent grafts became critical.[5] The Viatorr self-expandable polytetrafluoroethylene (PTFE)-covered stent-graft (W.L. Gore, Flagstaff AZ, United States) was approved by the FDA for a TIPS application towards the end of 2004.[5] Because of its more favourable long-term patency results, this stent graft represented a major breakthrough in counteracting the once prevailing poor patency outcomes.[5]

While the introduction of fully covered stents has markedly improved stent patency, early liver failure and hepatic encephalopathy continue to occur following TIPS placement.[4] Careful patient selection and post-procedural management are critical for optimal outcomes.[4]

Most evidence guiding TIPS practice comes from North America with limited data in sub-Saharan Africa.[3] United States guidelines recommend the use of centres where interventional radiology with a high level of expertise is available, with further support from a multidisciplinary team.[3] Ideally a centre that offers liver transplants should be utilised.[3] In South Africa, only two centres offer such services, highlighting the need for broader access.[6]

The first TIPS stent to be readily available for use in South Africa was the WallFlex stent and, as such, was the stent used at the institution, the Wits Donald Gordon Medical Centre (WDGMC) from 2011 to 2020. The WallFlex™ stent, developed by Boston Scientific, is primarily indicated for the palliative treatment of biliary strictures caused by malignant neoplasms. It is available in partially covered, fully covered and uncovered configurations.[7]

While the WallFlex stent is not specifically designed for TIPS procedures, it can be used. The stent's construction provides flexibility, and the radial forces help to improve the intraluminal patency.[7] Because of the highly favourable outcomes of the Viatorr stent internationally, this is currently the preferred stent for use at WDGMC from late 2020.

Few studies directly compare Viatorr with alternative fully covered or partially covered stents. While fully covered stents generally yield better patency, it remains unclear whether self-expandable stents like Viatorr reduce early postoperative complications or re-intervention rates. A recent multicentre study in China found no significant difference in clinical outcomes between Viatorr and other covered or bare stents, highlighting the need for further comparative research.[8] The aim of this study was to compare the 12-month clinical outcomes of WallFlex and Viatorr stents.

Research methods and design

This was a retrospective, single-centre comparative study conducted at a tertiary academic hospital. The study included adult patients (≥ 18 years) who underwent successful TIPS placement using either a WallFlex or Viatorr stent. Data were collected from an institutional database of consecutive patients treated between June 2018 and November 2023. The picture archiving and communication system (PACS), and Lancet, Ampath and Pathcare Vermaak laboratories database systems were accessed for data collection.

Patients were grouped according to the stent used: WallFlex (June 2018 – October 2020) and Viatorr (November 2020 – November 2023). All patients were followed for a minimum of 12 months post-TIPS. Because of the wide geographical referral base, formal follow-up intervals were not standardised. Instead, imaging reports available within the first 12 months post-TIPS on the hospital's PACS were reviewed to assess shunt patency and complications. The need for revision of a stent was used as a proxy for shunt dysfunction in cases without formal imaging follow-up.

Data collected included patient demographics, indication for TIPS (e.g., refractory ascites, variceal bleeding), urgency of the procedure (elective vs. salvage), liver disease aetiology and presence of pre-existing hepatic encephalopathy. Baseline clinical parameters included the Model for End-stage Liver Disease (MELD) and Child–Pugh scores, as well as laboratory values (creatinine, bilirubin, urea, international normalised ratio [INR], platelets, albumin and haemoglobin). Laboratory results were classified as low, normal or high based on standard reference ranges: bilirubin (5 µmol/L – 21 µmol/L), haemoglobin (12 g/dL – 17.5 g/dL), albumin (35 g/L – 52 g/L), urea (1.7 mmol/L – 8.3 mmol/L), creatinine (49 µmol/L – 90 µmol/L), INR (0.8–1.2) and platelets (150×10^9/L – 350×10^9/L).

Transjugular intrahepatic portosystemic shunt procedures were performed by experienced interventional radiologists. Stent selection was primarily based on availability, with WallFlex being the only option until 2020. Pressures were measured before and after TIPS placement to measure portosystemic pressure gradients (PSPGs). The goal was to achieve either a post-TIPS gradient <12 mmHg or a reduction of ≥50% from the baseline portosystemic gradient.

The primary outcome was to assess the requirement for TIPS revision within 12 months between the two stent types. Secondary outcomes included post-TIPS complications (e.g., persistent ascites, hepatic encephalopathy, shunt dysfunction), liver transplantation and mortality. Deaths were classified as either procedural or disease-related.

Statistical analysis

Descriptive analysis of all study data, by stent type, demographics, pre- and peri-TIPS study variables between

stent types and a comparison of outcomes between stent types were performed. Assuming both groups have a re-intervention rate of less than 85%, which represents an acceptable patency rate from prior studies and accepting up to a 10% difference as clinically acceptable, a sample size of 40 patients per group was needed to detect non-inferiority with 80% power and a 5% significance level.[8,9]

The chi-squared test was used for categorical variables (Fisher's exact test was used for 2 × 2 tables or where the assumptions of the chi-squared test were not met). Continuous variables were compared by the independent samples *t*-test (or the Wilcoxon Rank Sum test where the assumptions of the t-test were not met).

The primary outcome, TIPS revision within 12 months, was evaluated against an 85% benchmark for stent patency using a one-sample non-inferiority test with a -10% margin, reflecting the largest clinically acceptable deviation from this target. To assess the timing of revisions, time-to-event data were analysed using the Kaplan–Meier method, which allows for visualisation of the probability of remaining revision-free over time while accounting for censored data (patients lost to follow-up or without revision events). Differences in time to first revision between the WallFlex and Viatorr groups were formally compared using Cox proportional hazards regression, which estimates the hazard ratio and accounts for varying follow-up times between patients.

Secondary outcomes – including post-TIPS complications, hepatic encephalopathy, liver transplantation and mortality, were analysed using standard tests for categorical and continuous variables. All analyses were performed in SAS 9.4, with significance set at $p < 0.05$. This approach enabled the assessment of both event frequency and timing, while accounting for variable follow-up durations.

Ethical considerations

The study was approved by the Human Research Ethics Committee (medical) of the University of the Witwatersrand (reference number: M240344 M240522-D-0001). Patient consent was waived because of the retrospective nature of the study. No personally identifiable information was recorded during the study process.

Results

Study patients

A total of 83 patients with liver cirrhosis underwent TIPS creation with either a WallFlex ($n = 40$) or a covered Viatorr ($n = 43$) from June 2018 to November 2023. The electronic database with the relevant clinical information regarding the TIPS procedures could only be accessed from 2018 onwards, which narrowed the sampling pool. Table 1 details the baseline characteristics of these patients.

The included patients displayed a median age of 59 for the WallFlex group and 60 for the Viatorr. Of these, 50 (60%) were men and 33 (40%) were women. The main aetiology was liver cirrhosis secondary to non-alcoholic steatohepatitis (22%) and alcohol-related liver disease (20%). The mean MELD score in the WallFlex group was 17, and in the Viatorr group, it was 14. Ninety-two per cent of the patients displayed a Child–Pugh score of B. The results of the between-group comparisons are presented in Table 2. There were no significant differences between the stent groups with regard to any of the demographic, pre- or peri-TIPS variables. Thus, the outcomes of the TIPS procedures using the two stent types may be compared fairly.

TABLE 1: Baseline characteristics of study group.

Characteristic	Category	WallFlex stent ($N = 40$)		Viatorr stent ($N = 43$)		*p*
		n	%	*n*	%	
Year of TIPS stent	2018	7	18	0	0	n/a
	2019	20	50	0	0	-
	2020	11	28	1	2	-
	2021	2	5	15	35	-
	2022	0	0	16	37	-
	2023	0	0	11	26	-
Age (years)†		-	-	-	-	0.99
Sex		-	-	-	-	>0.99
	Male	24	60	26	60	-
	Female	16	40	17	40	-
Aetiology of liver disease	-	-	-	-	-	0.93
	NASH cirrhosis	7	18	11	26	-
	ASH cirrhosis	8	20	9	21	-
	Primary biliary cholangitis	5	13	5	12	-
	Autoimmune hepatitis	5	13	2	5	-
	Budd–Chiari	2	5	3	7	-
	Idiopathic cirrhosis	2	5	3	7	-
	Chronic hepatitis B	2	5	1	2	-
	Hepatitis C	2	5	1	2	-
	Other	7	18	8	19	-
Other aetiologies	Various‡	8	-	10	-	-

TIPS, transjugular intrahepatic portosystemic shunt; ASH, alcoholic steatohepatitis; NASH, non-alcoholic steatohepatitis; IQR, interquartile range.

†, Age (years): WallFlex stent (median 59, IQR 43–71 range 20–77); Viatorr stent (median 60, IQR, 50–66, range 20–74).

‡, Other aetiologies included metastatic colorectal cancer, alpha-1 antitrypsin deficiency, ARPKD, haemochromatosis (with/without HCC), IgG4-related disease, myelofibrosis, cholangiocarcinoma, chronic portal vein thrombosis and others.

TIPS procedures

Transjugular intrahepatic portosystemic shunt procedures were successfully performed in all the patients. The main indication for undergoing a TIPS creation was refractory ascites (57%) and variceal bleeding (55%). Only 9.6% of the TIPS procedures were indicated for emergency or salvage shunt creation.

The PSPGs were documented in 77/83 of the TIPS procedures. A post-TIPS PSPG of less than 12 mmHg or a 50% reduction in portosystemic pressures from pre-TIPS baseline was achieved in 36 (97%) of the WallFlex group and 36 (90%) in the Viatorr group. There were no significant differences in the proportion of patients who achieved post-TIPS PSPG < 12 mmHg ($p = 0.11$), ≥ 50% relative reduction in PSPG from pre-TIPS baseline ($p = 0.99$) or one/both of these outcomes ($p = 0.52$).

TABLE 2: Indications for transjugular intrahepatic portosystemic shunt and baseline laboratory parameters.

Characteristic	Category	WallFlex (*N* = 40)		Viatorr stent (*N* = 43)		*p*
		n	%	*n*	%	
Indications for TIPS						
	Refractory ascites	23	58	25	58	> 0.99
	Variceal bleed	24	60	22	51	0.51
	Hepatorenal syndrome	5	13	2	5	0.25
	Hepatic encephalopathy	4	10	4	9	> 0.99
	Hepatic hydrothorax	1	3	2	5	> 0.99
	Other	1	3	1	2	-
Emergency TIPS	-	3	8	5	12	0.71
MELD score†	-	-	-	-	-	0.083
Child Pugh score (*n* = 62/83)	-	-	-	-	-	0.67
	B	30	94	27	90	-
	C	2	6	3	10	-
Hepatic encephalopathy present	-	4	10	4	9	> 0.99
Creatinine (*n* = 62/83)	-	-	-	-	-	0.80
	Normal	15	47	16	53	-
	High	17	53	14	47	-
Bilirubin (*n* = 62/83)	-	-	-	-	-	0.60
	Normal	10	31	12	40	-
	High	22	69	18	60	-
Urea (*n* = 62/83)	-	-	-	-	-	0.62
	Normal	17	53	18	60	-
	High	15	47	12	40	-
INR (*n* = 62/83)	-	-	-	-	-	> 0.99
	Normal	17	53	16	53	-
	High	15	47	14	47	-
Platelets (*n* = 62/83)	-	-	-	-	-	0.12
	Low	28	88	21	70	-
	Normal	4	13	9	30	-
Albumin (*n* = 62/83)	-	-	-	-	-	0.78
	Low	22	69	22	73	-
	Normal	10	31	8	27	-
Haemoglobin (*n* = 62/83)	-	-	-	-	-	0.75
	Low	25	78	25	83	-
	Normal	7	22	5	17	-

MELD, model for end-stage liver disease; TIPS, transjugular intrahepatic portosystemic shunt; INR, international normalised ratio.

†, MELD score: WallFlex (mean ± standard deviation [s.d.] 17 ± 7, range 7–36); Viatorr stent (mean ± s.d. 14 ± 6, range 6–27).

Post-TIPS complications

Post-operative complications are listed in Table 3. There were post-TIPS complications in 32 (80%) of the WallFlex group and 26 (60%) of the Viatorr group. Persistent ascites was seen in 13 (33%) of the WallFlex and 12 (28%) of the Viatorr groups with hepatic encephalopathy occurring in eight (20%) of the WallFlex and nine (21%) of the Viatorr group. The other more prevalent complication was shunt failure, which was seen in 11 (28%) and 5 (12%) of the WallFlex and Viatorr groups, respectively. Shunt failure was usually determined by confirmatory ultrasound following

TABLE 3: Post-transjugular intrahepatic portosystemic shunt outcomes.

Characteristic	Category	WallFlex stent (*N* = 40)		Viatorr stent (*N* = 43)		*p*
		n	%	*n*	%	
Outcomes	Any complications	32	80	26	60	0.060
	Persistent ascites	13	33	12	28	0.81
	Hepatic encephalopathy	8	20	9	21	> 0.99
	Shunt failure	11	28	5	12	0.095
	Post-procedural bleeding	6	15	5	12	0.75
	Septicaemia	3	8	1	2	0.35
	Cardiac complications	2	5	0	0	0.23
A		36	97	34	85	0.11
B		26	70	29	73	0.99
A and/or B		36	97	36	90	0.52
Revision required‡	-	-	-	-	-	†
	No	29	73	28	65	-
	Yes	11	28	15	35	-
Number of revisions‡ (grouped)	-	-	-	-	-	0.79
	0	29	73	28	65	-
	1	7	18	10	23	-
	≥ 2	4	10	5	12	-
Reason for first revision (*n* = 26)	-	-	-	-	-	-
	Thrombosed stent	8	-	4	-	-
	Severe hepatic encephalopathy	2	-	3	-	-
	Bleeding	1	-	2	-	-
	Severe encephalopathy	-	-	3	-	-
	Other	-	-	2	-	-
Transplant‡	-	15	38	11	26	0.34
Mortality‡	-	15	38	9	21	0.21

Note: A: Post-TIPS PSPG <12 mmHg (*n* = 77/83); B: ≥50% PSPG reduction (*n* = 77/83).
PSPG, portosystemic pressure gradient ; TIPS, transjugular intrahepatic portosystemic shunt.
†, non-inferiority analysis reported; ‡, in first 12 months.

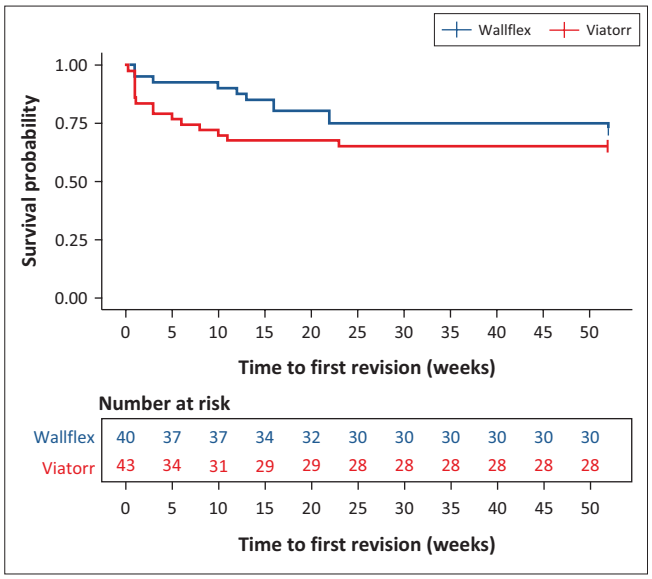
symptom recurrence. There were no significant differences in the overall (p = 0.060) or individual complication rates between the two stent types.

The stent types were evaluated against an anticipated patency rate, utilising the intervention rate as a benchmark of 85%, and a non-inferiority threshold of –10%. The patency rate of the WallFlex stent (73%, 95% CI 61% – 84%) did not demonstrate non-inferiority to this target (p = 0.64). Likewise, the patency rate of the Viatorr stent (65%, 95% CI 54% – 76%) did not demonstrate non-inferiority to this target (p = 0.93).

TIPS revision

Of the 83 TIPS creations during the time period, there were 11 (28%) WallFlex and 15 (35%) Viatorr patients that required TIPS revision within the first 12 months with a p-value of 0.79. One revision was required for 17 of these patients, whereas nine needed a further two or more interventions.

Of the 26 patients that required revision of their TIPS, the primary indication for revision was a thrombosed stent in eight (32%) of the WallFlex patients and four (15%) in the Viatorr group. The second most common reason for stent



TIPS, transjugular intrahepatic portosystemic shunt.

FIGURE 1: Kaplan–Meier survival analysis illustrating time to first transjugular intrahepatic portosystemic shunt revision (in weeks) in patients who received WallFlex and Viatorr stents.

revision was the development of severe hepatic encephalopathy which was noted in two (7.6%) of the patients who received a WallFlex stent and three (11.5%) who received a Viatorr stent.

There was no significant difference in the time to first revision between the two stent types (p = 0.30). The Kaplan–Meier plot is displayed in Figure 1. There was no significant difference in the number of revisions between the two stent types (p = 0.79).

Liver transplant

Fifteen patients (38%) in the WallFlex group received liver transplants within the first 12 months post initial TIPS insertion, and 11 (26%) in the Viatorr group. There was no significant difference in transplant rate between the two stent types (p = 0.34).

Mortality

The mortality rate within the first 12 months was 38% in the WallFlex group and 21% in the Viatorr group with a p value of 0.21. These deaths were all disease related. There was no significant difference in mortality between the two stent types (p = 0.21).

Discussion

In this single-centre, retrospective study comparing WallFlex and Viatorr stents for TIPS creation, the authors found no statistically significant differences in clinical outcomes between the two stent types over a 12-month follow-up period. Importantly, the rates of revision, post-operative complications and mortality did not significantly differ between groups, which suggests comparable clinical performance in this cohort.

These findings align with previous studies that have compared PTFE-covered stents, including the Viatorr endoprosthesis, to either bare-metal or partially covered alternatives.[10,11,12,13] Covered stents, such as Viatorr, have been demonstrated in multiple studies to reduce rates of shunt dysfunction and improve patency compared to bare-metal stents.[10,11,12,13] However, studies that directly compare different covered stents, including WallFlex, are limited.

The slightly higher, although statistically insignificant, rate of shunt dysfunction in the Viatorr group (35% requiring revision vs. 28% in WallFlex) contrasts with the many reports which have demonstrated superior durability of the Viatorr stent. However, this may reflect the real-world variability in stent performance, especially with the early learning curve for first time Viatorr uses and the settings where follow-up is inconsistent or imaging protocols are not standardised. In this study, revision was used as a proxy for shunt dysfunction because of the lack of dedicated follow-up imaging protocols, which may limit the sensitivity for detecting early asymptomatic dysfunction.

Hepatic encephalopathy occurred at similar rates between the two groups, with no significant difference noted (20% WallFlex vs. 21% Viatorr). This suggests that stent type alone may not be a key driver of post-TIPS encephalopathy risk, consistent with prior literature that emphasises patient-related risk factors such as baseline hepatic function and age, over procedural ones.[14]

Notably, although numerically higher mortality and transplant rates were observed in the WallFlex group, these differences were not statistically significant. All reported deaths were attributed to underlying liver disease rather than procedural complications, reiterating the importance of disease severity in patient prognosis post-TIPS.[3]

Artificial intelligence-assisted algorithms may, in future, help in predicting post-TIPS survival. A recent study performed by Binlin Da et al. developed and validated a random forest model using seven variables (e.g. bilirubin, sodium, ammonia, albumin, age, creatinine, ascites) to predict the 1-year survival in cirrhotic patients post-TIPS.[15] The model achieved strong performance in accuracy and was demonstrated to outperform conventional scores such as MELD and Child–Pugh.[15]

The results highlight that in resource-limited settings, or when device availability dictates stent selection, WallFlex stents may offer a viable alternative to Viatorr without compromising short-term clinical outcomes. However, given the retrospective nature of this study and the variability in follow-up, prospective trials with standardised imaging protocols and long-term outcomes are warranted.

Limitations of the study

The retrospective single-centre nature of the study limits the generalisability of the findings. The selection of the stent type used, in particular the period in which WallFlex was utilised,

introduces the potential for selection bias as the stent choice was largely based on availability rather than on clinical indications. In saying this, however, the patient baseline characteristics were well matched.

Follow-up of patients was performed exclusively by reviewing imaging reports available on the hospital PACS. Patients who did not undergo follow-up imaging at the institution – either because of logistical reasons or follow-up performed elsewhere – were not captured in the analysis. As a result, post-TIPS complications may be underreported, especially in cases where no imaging was performed, despite clinical deterioration or complications occurring outside the facility.

To address this, the need for TIPS revision was used as a proxy measure to assess stent function and clinical outcomes. While this approach provides an objective and reliable marker, it may underestimate complications or dysfunctions that did not prompt procedural intervention.

Additionally, the sample size was relatively small with 83 patients split between the two stent groups because of limitations in electronic database availability. While this was sufficient for the primary analysis based on non-inferiority assumptions, the study may have been underpowered to detect smaller differences in secondary outcomes, such as specific complications or mortality rates.

The use of the WallFlex stent in this study was off-label. At the time of treatment, it was the only covered self-expandable metal stent available to the interventional radiologist and its selection was based on availability rather than design suitability for TIPS. Placement of both partially and fully covered WallFlex stents is technically challenging, particularly in achieving precise positioning at the portal end. This limitation may contribute to suboptimal clinical outcomes and higher rates of re-intervention. In contrast, the Viatorr stent is specifically engineered for TIPS, allowing preservation of the contralateral portal vein at the bifurcation and offering a design tailored to the procedure.[16]

Finally, there was no standardised follow-up protocol or dedicated imaging schedule post-TIPS. The timing and frequency of follow-up imaging varied widely, which could have influenced the detection rates of complications and shunt dysfunction. These limitations highlight the need for further prospective, multi-centre studies with structured follow-up protocols and larger patient populations to confirm and expand upon these findings.

Conclusion

This single-centre, retrospective study demonstrates that both WallFlex and Viatorr stents offer comparable clinical outcomes when used for TIPS creation in patients with liver cirrhosis. Despite not meeting non-inferiority thresholds relative to an anticipated 12-month patency rate of 85%, both stent types showed acceptable performance with no statistically significant differences in revision rates, post-operative complications or mortality. These findings suggest that the WallFlex stent may serve as a clinically reasonable alternative to the Viatorr stent, particularly in settings where resource constraints or availability limit options.

In sub-Saharan Africa, where TIPS expertise remains limited, early adoption of the Viatorr stent is likely to be beneficial as interventional radiology units continue to develop their skills. Although the Viatorr carries a higher upfront cost, this is expected to be offset in the long term by improved clinical outcomes and reduced need for repeat interventions.

While the results provide valuable insight into real-world TIPS outcomes, especially in diverse patient populations, the absence of standardised follow-up imaging and the retrospective design present important limitations. Future prospective studies with uniform follow-up protocols and longer observation periods are necessary to further clarify the comparative efficacy and long-term patency of these stents.

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Competing interests

The authors declare that they have no financial or personal relationships that may have inappropriately influenced them in writing this article.

Authors' contributions

K.F.T. was responsible for the research concept, literature review, development of the study method, data collection, analysis and preparation of the article. C.S. was responsible for supervision, reviewing and editing. S.R. was responsible for reviewing and editing.

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Data availability

Data supporting the findings of this study are available from the corresponding author, K.T.F., upon request.

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