Heart Surgery Forum 2023; 26(5): E455–E462
doi: 10.59958/hsf.6665

https://journal.hsforum.com/

Article

Percutaneous versus Cutdown Access for Endovascular Aortic Repair

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Submitted: 26 July 2023 Revised: 6 September 2023 Accepted: 8 September 2023 Published: 20 September 2023

Abstract

Background: This study aimed to compare the outcomes of the percutaneous femoral access and open surgical cutdown access approaches in patients undergoing thoracic/abdominal endovascular aortic repair. **Methods**: We retrospectively reviewed the medical records of 59 patients who underwent a thoracic/abdominal endovascular aortic repair at a single tertiary care hospital between 2015 and 2022. Based on their femoral access type, the patients were categorized into the "percutaneous" or "cutdown" groups. Using a computerized sheet, relevant patient data (including demographic information and patient risk factors) were collected. The operative duration, complication rates, mortality rates, intensive care unit admission and stay durations, and total hospital stay were compared between the two groups. The primary outcomes were differences in the postoperative morbidity and mortality associated with the two approaches. **Results**: The cutdown and percutaneous groups comprised 24 (41%) and 35 (59%) patients, respectively. The two groups displayed comparable demographic and clinical characteristics ($p > 0.05$). However, the vascular anatomy differed with the common femoral artery diameter being larger in the percutaneous group compared to the cutdown group (9.63 ± 1.81 mm *vs*. 8.49 ± 1.54 mm, $p = 0.028$). The ratio of the sheath diameter to the common femoral artery diameter was significantly lower in the percutaneous group than in the cutdown group (0.73 ± 0.16 *vs*. 0.85 ± 0.20, $p = 0.027$). A ratio of ≥0.74 was associated with a higher risk of complications (odds ratio, 12.0; 95% confidence interval, 1.4–102.2; $p = 0.023$) and mortality (odds ratio, 5.79; 95% confidence interval, 1.13–29.6; $p = 0.035$). Additionally, the operative duration was significantly shorter in the percutaneous group than in the cutdown group (141.43 ± 97.05 min *vs*. 218.46 ± 126.31 min, $p = 0.001$). Compared to the cutdown group, the percutaneous group experienced a shorter total hospital stay (21.54 ± 21.49 days *vs*. 11.60 ± 12.09 days, $p = 0.022$) and lower intensive care unit-admission rates (66.7% *vs*. 40%, $p = 0.044$). **Conclusion**: The percutaneous approach is a viable and more time-efficient alternative to the traditional cutdown method for delivering vascular endografts. It is associated with a significantly shorter operative duration and briefer hospital stays. Additionally, the ratio of the sheath diameter to the common femoral artery diameter can help surgeons preoperatively predict and anticipate the risks of complications and mortality. Future in-depth research is necessary to better understand the association between this ratio and postoperative outcomes and complications.

Keywords

aortic aneurysm; femoral artery; endovascular procedures; percutaneous; cutdown access

Introduction

The management of aortic pathologies has fundamentally changed over the years, with endovascular approaches being increasingly utilized. The use of endovascular procedures for both abdominal and thoracic aortic pathologies has become increasingly prevalent [1]. Thoracic/abdominal endovascular aortic repair (T/EVAR) involves the minimally invasive delivery of stent grafts via an accessible artery, frequently the common femoral artery (CFA), and has primarily replaced the more invasive open aortic repair (OAR). T/EVAR procedures may be superior to OAR in terms of lower operative and 1-year mortality rates, shorter hospital stays, and fewer periprocedural complications [2,3]. Advancements in technology (including a decrease in device sheath sizes and the development of innovative and minimally invasive vascular access methods) have greatly improved endovascular procedures [4,5]. These changes have decreased the frequency of access-site complications associated with open surgical cutdown exposure (such as seromas, wound dehiscence, and surgical site infections), which was traditionally required for larger sheath sizes [6].

A cutdown or percutaneous method may be used to achieve large-bore vascular access in T/EVAR. In the conventional cutdown approach, an open surgical incision is made, and the accessible vessel is prepped to deliver large-bore graft systems. Conversely, in the percutaneous approach, ultrasound guidance is utilized, and suture-mediated closure devices are used to enable quick and secure vascular access to deliver large-bore devices [7].

An open surgical cutdown was considered the standard approach for obtaining femoral artery access; however, percutaneous closure is gaining popularity for achieving the same. Nevertheless, several patient-related factors have been identified as potential contraindications for percutaneous access. Previous studies have yielded inconsistent findings regarding the risk factors associated with percutaneous failure and complications; these factors include groin scars from prior interventions, femoral artery calcification, and larger sheath sizes [8–14]. Some studies have found these factors to be significant, while others have not [15,16]. Several other studies have advocated the use of the percutaneous approach and have revealed a relatively greater reduction in the operative procedural time [10,13,17–20] and length of hospital stay [10,13,21,22] than that achieved with the more invasive open surgical cutdown.

Although several studies have reported successful outcomes with the percutaneous approach, there is a lack of consensus regarding its superiority to the cutdown approach. The lack of a consistent body of evidence in the literature may have hindered the universal adoption of the percutaneous access technique. In this study, we have compared our experiences with the percutaneous and cutdown approaches for obtaining femoral artery access and have evaluated the outcomes and complications associated with both techniques.

Materials and Methods

Study Population

This was a retrospective, single-center, cohort study. It was performed in accordance with the principles outlined in the Declaration of Helsinki and was approved by our institutional ethics committee. Overall, 59 patients who underwent T/EVAR at our institution between 2015 and 2022 were included in this study; we included all indications for surgery, such as repair of thoracic or abdominal aortic aneurysms, aneurysm ruptures, and aortic dissections. The exclusion criteria were patients with concomitant CFA aneurysms and those aged <18 years. Based on their femoral access type (i.e., percutaneous femoral access or open surgical cutdown), the patients were either categorized into the "percutaneous group" or the "cutdown group", respectively. Patient data were collected using a computerized sheet that contained all relevant variables, including demographic information and patient risk factors. The outcomes of both techniques, namely operative duration, complication rates, mortality rates, intensive care unit (ICU) admission and stay duration, and total hospital stay, were compared between the two groups. Technical success of percutaneous access was defined as successful arterial closure without the need to convert to an open surgical cutdown. Access failure was defined as the occurrence of arterial closure requiring conversion from initial percutaneous access to surgical cutdown. The data collected to estimate the risk of complications and mortality included patient demographics, comorbidities, presence of a scarred groin (indicative of previous interventions), type of femoral access, CFA size (diameter), size of the sheath used intraoperatively (diameter), and ratio of the sheath diameter to the CFA diameter (i.e., the sheath:CFA ratio; the sheath diameter was divided by three to convert its unit from Fr to mm).

Procedure

The percutaneous approach was performed using Perclose® ProGlide™ closure devices (Abbott Vascular, Abbott Park, IL, USA) to "preclose" vascular accesses. Additional closure devices were used when necessary. Procedures for open surgical cutdown access and closure were performed as standardized; a suitably sized transverse surgical incision was made above and parallel to the inguinal ligament after identifying the CFA. The proximal and distal ends of the CFA were controlled using vessel loops. The sheath and wire were removed after the procedure was completed, and the edges of the vessel were debrided. The vessel was closed either directly or with patch angioplasty using a bovine pericardium. Upon access vessel closure, peripheral angiography was performed to assess for any vascular complications (such as vessel dissection, perforation, and stenosis). Conservative management was the preferred approach to resolve these complications.

Percutaneous versus Cutdown Selection Criteria

Selection of the approach for obtaining vascular access depended on multiple factors, including the vascular anatomy (a small CFA luminal size [<6 mm] was considered non-ideal for percutaneous access). Additionally, marked vessel tortuosity, presence of vessel wall calcification (a highly calcified CFA was not preferred for a suture-mediated closure), and presence of a previously scarred groin were considered an indication for the open surgical cutdown approach. Additionally, the presence of associated polytrauma in the context of aortic dissection notably influenced the choice of access method, favoring the percutaneous approach due to its expedited accessibility. Finally, surgeon preference and experience with percutaneous access were considered during the selection process (some surgeons prefer open surgical cutdown to the percutaneous approach).

Table 1. Demographic and clinical characteristics of patients with percutaneous and cutdown vascular access.

Characteristics	Total (n = 59)	Cutdown (n = 24)	Percutaneous (n = 35)	p value
Age, years	59	57.29 ± 20.58	62.06 ± 18.56	0.392
Sex				
Male, n (%)	54 (91.5)	23 (95.8)	31 (88.6)	0.325
Female, n (%)	5 (8.5)	1 (4.2)	4 (11.4)	
Body mass index, kg/m^2	59	29.42 ± 10.55	27.76 ± 6.67	0.908
History of smoking				
Former, n (%)	7 (11.9)	3 (12.5)	4 (11.4)	0.966
Never, n (%)	13 (22.0)	6 (25.0)	7 (20.0)	
Current, n (%)	16 (27.1)	6 (25.0)	10 (28.6)	
Unknown, n (%)	23 (39.0)	9 (37.5)	14 (40.0)	
Previous groin intervention, n (%)				
No, n (%)	45 (76.3)	17 (70.8)	28 (80.0)	0.416
Yes, n (%)	14 (23.7)	7 (29.2)	7 (20.0)	
Comorbidities				
History of HTN, n (%)	32 (54.2)	11 (45.8)	21 (60.0)	0.283
History of DM, n (%)	24 (40.7)	8 (33.3)	16 (45.7)	0.342
History of dyslipidemia, n (%)	16 (27.1)	8 (33.3)	8 (22.9)	0.374
History of CAD, n (%)	14 (23.7)	6 (25.0)	8 (22.9)	0.849
Renal insufficiency, n (%)	7 (11.9)	2 (8.3)	5 (14.3)	0.487
History of CHF, n (%)	6 (10.2)	2 (8.3)	4 (11.4)	0.699
History of CVA, n (%)	5 (8.5)	3 (12.5)	2 (5.7)	0.358
History of COPD, n (%)	3 (5.1)	0 (0.0)	3 (8.6)	0.141
History of PAD, n (%)	2 (3.4)	1 (4.2)	1 (2.9)	0.785
History of malignancy, n (%)	2 (3.4)	0 (0.0)	2 (5.7)	0.233

Abbreviations: CHF, congestive heart failure; CVA, cerebrovascular accident; CAD, coronary artery disease; DM, diabetes mellitus, COPD, chronic obstructive pulmonary disease; HTN, hypertension; PAD, peripheral artery disease. Categorical data are expressed as numbers (%), and continuous data are expressed as the mean ± standard deviation.

Statistical Analyses

Numerical variables are presented as mean ± standard deviation. According to the Shapiro-Wilk test, the data was non-normally distributed. Categorical and continuous variables were compared using the chi-square test and Mann-Whitney U-test, respectively. Statistical significance was defined as $p < 0.05$. All statistical analyses were performed using the Statistical Package for the Social Sciences (version 25; IBM Corp, Armonk, NY, USA).

Results

Of the 59 patients included (54 men and 5 women; mean age = 60.1 ± 19.4 years), 24 (41%) underwent surgical cutdown and 35 (59%) underwent the percutaneous procedure during the study period. The patient demographics and clinical characteristics are summarized in Table 1. The two groups did not differ significantly in terms of patient age, sex, body mass index (BMI), smoking status, groin intervention history, and risk factors ($p > 0.05$).

Table 2 presents the intraoperative details of the two groups. Overall, 29 TEVAR, 26 EVAR, and 4 Chimney procedures were performed. The operation schedule priority, as seen in Table 2, showed that more than half (64.4%) of the cases were considered emergencies. This finding can be attributed to the presence of multiple concomitant injuries in cases of polytrauma and aortic dissections. The most common indication for surgery was an aneurysm, observed in 57.6% (n = 34) of the cases, followed by trauma and aortic dissection in 35.6% (n = 21) of patients. The majority of the patients received general anesthesia (n = 47, 79.7%); conversely, only nine and three patients received regional and local anesthesia, respectively.

Analysis of operative details revealed that the operative duration was significantly shorter in the percutaneous group than in the cutdown group (141.43 ± 97.05 min *vs.* 218.46 ± 126.31 min, $p = 0.001$; Fig. 1). The estimated blood loss was higher in the cutdown group than in the percutaneous group (385.71 ± 274.16 *vs.* 325.00 ± 279.31, $p = 0.614$); this difference was minor and did not reach statistical significance ($p > 0.05$). Moreover, the vascular anatomy of the patients significantly differed, with the CFA diameter being larger in the percutaneous group than in the

Table 2. Intraoperative outcomes of patients undergoing percutaneous and cutdown vascular access.

Procedural information	Total (*n* = 59)	Cutdown (*n* = 24)	Percutaneous (*n* = 35)	*p* value
Operation schedule priority, *n* (%)				
Elective	21 (35.6)	5 (20.8)	16 (45.7)	0.050
Emergency	38 (64.4)	19 (79.2)	19 (54.3)	
Indication for surgery, *n* (%)				
Aneurysm	34 (57.6)	12 (50.0)	22 (62.9)	0.138
Aortic dissection	21 (35.6)	12 (50)	9 (25.7)	
Aortic ulcer	2 (3.4)	0 (0.0)	2 (5.7)	
Aortoesopheageal fistula	2 (3.4)	0 (0.0)	2 (5.7)	
Operation type, *n* (%)				
Chimney	4 (6.8)	0 (0.0)	4 (11.4)	0.100
EVAR	26 (44.1)	9 (37.5)	17 (48.6)	
TEVAR	29 (49.2)	15 (62.5)	14 (40.0)	
Operation duration (min)		218.46 ± 126.31	141.43 ± 97.05	0.001**
Estimated blood loss (mL)		266.67 ± 251.373	215.71 ± 228.090	0.614
CFA size (mm)		8.49 ± 1.54	9.63 ± 1.81	0.028*
Sheath size (mm)		6.94 ± 0.71	6.86 ± 0.90	0.879
Sheath:CFA ratio		0.85 ± 0.20	0.73 ± 0.16	0.027*
Anesthesia used				
GA, *n* (%)	47 (79.7)	20 (83.3)	27 (77.1)	0.336
LA, *n* (%)	3 (5.1)	0 (0.0)	3 (8.6)	
Regional, *n* (%)	9 (15.3)	4 (16.7)	5 (14.3)	

Abbreviations: EVAR, Endovascular aneurysm repair; TEVAR, Thoracic endovascular aortic repair; CFA, common femoral artery; LA, Local anesthesia; GA, General anesthesia. Categorical data are expressed as numbers (%), and continuous data are expressed as the mean ± standard deviation. $^{**}p < 0.01$, $^{*}p < 0.05$.

cutdown group (9.63 ± 1.81 mm *vs.* 8.49 ± 1.54 mm, p = 0.028). The sheath:CFA ratio was significantly lower in the percutaneous group than in the cutdown group (0.73 ± 0.16 *vs.* 0.85 ± 0.20, p = 0.027; Fig. 2, Table 2). Regarding the postoperative outcomes, access-related complications did not differ significantly between the two groups, with 14.3% (n = 5) and 12.5% (n = 3) of the patients in the percutaneous and cutdown groups developing groin hematomas (p = 0.844), respectively.

The technical success rate for percutaneous closure was 91.4%, with only three patients requiring conversion to the surgical cutdown approach (Table 3).

The all-cause mortality rate did not differ significantly between the two groups. Only two patients were noted to have died from vascular related issues. One patient experienced a brainstem ischemic stroke shortly after an emergency T/EVAR procedure that had covered the origin of the subclavian artery. The other patient suffered an injury to the renal artery following a particularly complicated Chimney procedure; the patient experienced intrabdominal hemorrhage and subsequent disseminated intravascular coagulation. Nine patients died from non-vascular issues; the reasons for death included severe traumatic brain injuries and hemorrhage following polytrauma cases as well as severe aortic dissections/transections cases. Postoperatively, the rate of ICU transfer was higher in the cutdown group than in the percutaneous group (n = 16 *vs.* 14, p = 0.044); however, these high rates can be attributed to the presence of multiple concomitant head and/or abdominal injuries following polytrauma. The mean length of hospital stay in the cutdown group was approximately double the length in the percutaneous group (21.54 ± 21.49 days *vs.* 11.60 ± 12.09 days, p = 0.022); this difference was statistically significant (Table 3).

The findings of a bivariate logistic regression analysis showed that when the sheath:CFA ratio was ≥0.74, it was found to be a significant predictor of mortality and complications in both groups. The OR of mortality for patients with a sheath:CFA ratio of ≥0.74 was 5.79 (95% CI, 1.13–29.6; p = 0.035), meanwhile the OR for postoperative complications was 12.0 (95% CI, 1.4–102.2; p = 0.023). Additionally, a sheath size of ≥7.34 mm was associated with higher rates of complications (OR, 2.24; 95% CI, 0.52–9.68; p = 0.280) and mortality (OR, 4.89; 95% CI, 0.96–25.05; p = 0.057); however, this result was not statistically significant.

Discussion

With the increasing use of endovascular interventions, the use of the percutaneous approach for obtaining femoral

Table 3. Postoperative outcomes of patients undergoing percutaneous and cutdown vascular access.

Postoperative outcomes	Total (n = 59)	Cutdown (n = 24)	Percutaneous (n = 35)	p value
Access-related complications				
Access failure, n (%)	3 (5.1)	0 (0.0)	3 (8.6)	0.141
Groin Hematoma, n (%)	8 (13.5)	3 (12.5)	5 (14.3)	0.844
Complication rate[a]				
No, n (%)	49 (83.1)	21 (87.5)	28 (80.0)	0.451
Yes, n (%)	10 (16.9)	3 (12.5)	7 (20.0)	
All-cause mortality				
Not died, n (%)	48 (81.4)	21 (87.5)	27 (77.1)	0.316
Died, n (%)	11 (18.6)	3 (12.5)	8 (22.9)	
Cause of death				
Non-vascular, n (%)	9 (81.8)	2 (66.7)	7 (87.5)	0.425
Vascular, n (%)	2 (18.2)	1 (33.3)	1 (12.5)	
Time of death				
>30-day hospital, n (%)	1 (1.7)	0 (0.0)	1 (2.9)	0.510
30-day hospital, n (%)	10 (16.9)	3 (12.5)	7 (20.0)	
ICU transfer				
None, n (%)	29 (49.2)	8 (33.3)	21 (60.0)	0.044*
Yes, n (%)	30 (50.8)	16 (66.7)	14 (40.0)	
ICU duration		5.63 ± 5.08	3.64 ± 1.91	0.595
Total hospital stay (in days)		21.54 ± 21.49	11.60 ± 12.09	0.022*

Abbreviations: ICU, Intensive care unit. Categorical data are expressed as numbers (%) unless otherwise indicated. [a]One patient had more than one complication. *$p < 0.05$.

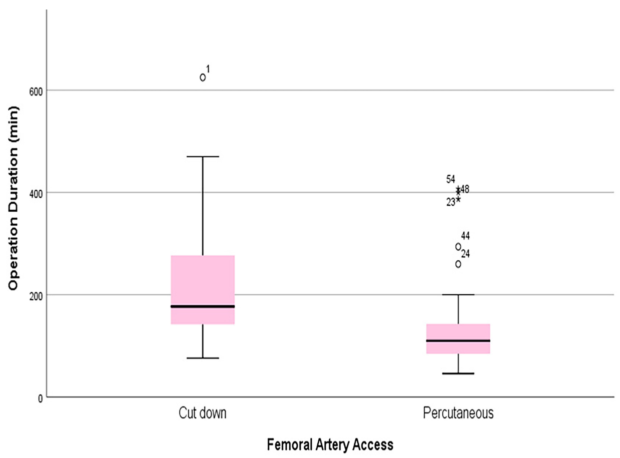

Fig. 1. A simple boxplot of operative duration (min) by the femoral artery access type. Fig. 1 is a box plot wherein the X-axis represents the femoral artery access type, and the Y-axis represents the operative duration (in minutes). The vertical line at the bottom indicates the minimum value. The vertical line at the top indicates the maximum value. The line at the center indicates the median value. The boxes below and above the median line represent the first and third quartiles, respectively. o denotes mild outliers. ★ denotes extreme outliers. The number denotes the case number.

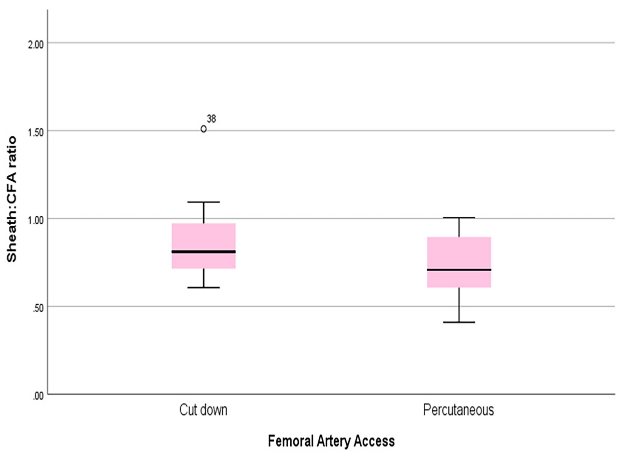

Fig. 2. A simple boxplot of the sheath:CFA ratio by the femoral artery access type. Fig. 2 is a box plot wherein the X-axis represents the femoral artery access type and the Y-axis represents the sheath:CFA ratio. CFA, common femoral artery. o denotes mild outliers. The number denotes the case number.

artery access in the repair of thoracic and abdominal aortic pathologies has become more frequent. This applies not only to cases of elective T/EVAR procedures, but also to cases of ruptured abdominal aortic aneurysms and emergencies, where percutaneous approaches are preferred due to their ability to shorten the operative duration and length of hospital stay [23]. This has been corroborated by extensive research and randomized controlled trials, which have revealed greater success rates, shorter procedural times and hospital stays, and lower complication rates in cases of percutaneous interventions than in those of open surgical approaches [20,24]. The complete percutaneous approach for arterial access and closure reduces procedural invasiveness, thereby contributing to further improvement in the recovery process of the patients [20,24].

However, despite the growing use of percutaneous approaches, it is still unclear whether they are superior to cutdown for obtaining arterial access during T/EVAR procedures. Therefore, we conducted this single-center study to compare the clinical outcomes between the percutaneous approach and the cutdown approach. The primary finding of our study was that the operative duration and length of hospital stay were significantly shorter in the percutaneous group than in the cutdown group. Another key discovery was the significantly higher sheath:CFA ratio in the cutdown group; when this ratio was $\geq$0.74, it was found to be associated with a greater risk of complications and mortality. Additionally, the frequency of ICU transfer was significantly lower in the percutaneous group than in the cutdown group.

The ultrasound-guided percutaneous approach had a success rate of 91.4% in our single-center study; the success rates for percutaneous access in previously published studies varied between 71% and 100% [5,9,25]. Bensley *et al*. [18] suggested that percutaneous failure is more likely to occur in patients with a smaller vessel size, since the narrow diameters of the diseased CFAs and external iliac arteries may not provide sufficient space for the optimal functioning of the Perclose ProGlide device. Therefore, in our study, we assessed the access vessel size and found that the CFA diameter was significantly larger in patients in the percutaneous group than in those in the cutdown group (9.63 mm *vs*. 8.49 mm, $p = 0.014$). Furthermore, compared to the cutdown group, the percutaneous group had a shorter procedural time (218 *vs*. 141 min), shorter length of hospital stay (21 *vs*. 11.6 days), and lower rate of ICU transfer (66.7% *vs*. 40%). Our study findings corroborated the findings of previously published studies, wherein the mean total operative time [26] and length of hospital stay [20,27] were significantly decreased in the percutaneous group as compared to those in the cutdown group.

The outcomes of percutaneous versus cutdown in different pathological entities have shown consistent findings. One particular investigation that focused on vascular access in the context of aortic aneurysms showed that percutaneous access was indeed associated with shorter operative duration, shorter length of hospital stay, and fewer wound related complications [24]. Additionally, a separate study conducted a comparative analysis of percutaneous and cutdown approaches in patients with ruptured aortic aneurysms. The study observed that percutaneous procedures were associated with shorter procedural durations compared to the cutdown approach, but hospital stay durations exhibited minimal differences between the two approaches. Moreover, those who underwent the percutaneous method exhibited a considerably decreased 30-day mortality rate [28].

Despite the benefits associated with percutaneous access, it is not without technical challenges and potential complications. Obesity, femoral artery calcification, groin scars from previous interventions, and larger sheath sizes were the most commonly reported reasons for technical failure in previous studies [19,29]. Obesity and groin scars can cause the ProGlide™ suture to break or cause premature locking of knot hemorrhage [29,30]. Meanwhile, >50% calcification of the femoral artery, particularly on the anterior wall, can lead to disruption of the plaque or even accidental suturing of the posterior wall [20,31]. These complications associated with percutaneous access can be particularly problematic, because they can result in procedural failure and require conversion to open repair.

In this study, the sheath size, estimated blood loss, type of anesthesia used, ICU stay duration, operation schedule priority, and demographic information did not differ significantly between the two groups.

Several studies have shown that larger sheath sizes are associated with increased risks of percutaneous access failure during T/EVAR procedures [5,12,32]. An increased risk of failure with a larger sheath size was also reported in two recent meta-analyses [33,34]. Similarly, we found that when the sheath size was $\geq$7.34 mm there were higher rates of complications and mortality; however, our results did not reach statistical significance ($p > 0.05$).

Existing evidence suggests a correlation between the sheath:CFA ratio and the likelihood of closure failure [35]. A study by Rijkée *et al*. [35] assessed predictors of closure failure in percutaneous repair performed using the Prostar XL vascular device. It was one of the first studies to assess the sheath:CFA ratio and its association with access failure. They found that a large sheath size and a sheath:CFA ratio of >0.75 were accurate predictors of access failure [35]. This is corroborated by the findings of the current study, wherein a large sheath:CFA ratio ($\geq$0.74 mm) was found to be associated with higher rates of complications and mortality.

Saadi *et al*. [36] revealed that thickening in the femoral artery reduces the success rate of the percutaneous approach. Therefore, the CFA should be assessed regularly using computed tomography and reviewed in detail. Additionally, determining the CFA size and calculating the sheath:CFA ratio preoperatively can help surgeons assess and anticipate the risk of complications and mortality. Our findings revealed significant differences in the CFA diameter and the sheath:CFA ratio between the two groups. Notably, the sheath:CFA ratio (obtained using both the CFA and sheath sizes) was significantly lower in the percutaneous group (0.73 $\pm$ 0.16) than in the cutdown group (0.85 $\pm$ 0.20). When this ratio was $\geq$0.74, it was found to be associated with higher rates of complications and mortality.

This suggests that the CFA size and the sheath size alone may be unreliable predictors of technical failure; however, their ratio can be a more accurate predictor. Other factors, such as advanced age; sex; obesity; presence of a previously scarred groin; CFA size; history of hypertension, diabetes mellitus, and dyslipidemia; and renal insufficiency, were not found to be accurate predictors of complications or mortality.

Limitations

One of the primary limitations of our study is the relatively low sample size. As a result, the statistical power of our analysis might be limited, potentially affecting the generalizability of our results to broader populations. Additionally, this study was conducted in a single tertiary care center where data was collected and analyzed from a retrospective database.

Conclusion

The percutaneous approach for delivering endografts is a viable and more time-efficient alternative to the traditional surgical cutdown method. Our study determined that percutaneous access is associated with a significantly shorter operative duration and overall hospital stay. Furthermore, preoperative consideration of the sheath:CFA ratio can help identify patients at a higher risk of complications and adverse outcomes, thereby serving as a valuable tool for surgeons to predict and anticipate potential risks and take the necessary preventative measures. Further research is required to gain a deeper understanding of the association between the sheath:CFA ratio and the postoperative outcomes and complications in patients.

Abbreviations

T/EVAR, Thoracic/abdominal endovascular aortic repair; CFA, common femoral artery; OAR, open aortic repair; sheath:CFA, ratio of the sheath diameter to the CFA diameter; OR, odds ratio; CI, confidence interval.

Availability of Data and Materials

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Author Contributions

AA, SA, TAla, BA, and KI designed and gave the main idea for the research study. AA, SA, TAla, BA, MYA, TAlt, and KI preformed research and collected the data. TAla, MYA, and TAlt analyzed the data. All authors contributed to editorial changes in the manuscript. All authors read and approved the final manuscript. All authors have participated sufficiently in the work and agreed to be accountable for all aspects of the work.

Ethics Approval and Consent to Participate

The study was approved by the Institutional Review Boards of King Saud University – College of Medicine [Project No. E-22-7129], all procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee, and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. The need for patient informed consent was waived by the Institutional Review Boards of King Saud University because of the retrospective design of the study. All research methods were carried out in accordance with relevant guidelines and regulations.

Acknowledgment

Not applicable.

Funding

This research received no external funding.

Conflict of Interest

The authors declare no conflict of interest.

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