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RESEARCH ARTICLE

HIGH RADIOCEPHALIC VERSUS BRACHIOCEPHALIC ARTERIOVENOUS FISTULA IN BORDERLINE CEPHALIC VEINS: EFFECT OF TECHNIQUE OPTIMIZATION ON OUTCOMES

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ABSTRACT

Introduction: Brachiocephalic arteriovenous fistulae (BC AVF) are often preferred over distal fistulae in patients with borderline cephalic veins due to higher reported maturation rates. However, they are associated with increased complications and early utilization of proximal venous access. This study evaluates whether high radiocephalic (RC) AVF with technical modifications can achieve comparable outcomes. **Material and methods:** This retrospective comparative study included 50 patients with cephalic vein diameter 1.5–2 mm between January 2025 and December 2025. Patients were divided into two groups: High RC AVF (n=25), constructed using modified side-to-side anastomosis with selective intraoperative vein dilatation, and BC AVF (n=25), created using standard end-to-side technique. Primary outcome was functional maturation at 6 weeks. Secondary outcomes included time to maturation, complications, and need for secondary intervention. **Results:** Maturation rates were comparable between groups (72% vs 80%, p=0.51). The mean time to maturation was longer in the High RC group (44.2 ±8.6 vs 38.5 ±7.9 days, p=0.03). Overall complication rate was significantly lower in the High RC group (12% vs 36%, p=0.04). No cases of steal syndrome were observed in the High RC group. **Conclusions:** High RC AVF using optimized surgical techniques provides comparable maturation outcomes to BC AVF in borderline veins, with fewer complications and better preservation of proximal access.

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INTRODUCTION

Autogenous arteriovenous fistula (AVF) remains the preferred vascular access for hemodialysis owing to superior long-term patency and lower complication rates [1]. Distal radiocephalic AVF is recommended as the first-line access; however, its success is limited in patients with small-caliber veins [2]. Brachiocephalic AVF offers higher blood flow and improved maturation rates [3] but is associated with complications such as steal syndrome, venous hypertension, and loss of proximal access sites. Recent technical modifications, including modified side-to-side (mSTS) anastomosis and intraoperative venous dilatation, have been proposed to enhance outcomes in borderline veins [4].The present study evaluates whether these techniques can improve outcomes of high radiocephalic AVF to levels comparable with brachiocephalic AVF.

MATERIAL AND METHODS

Study design: Retrospective observational study conducted at a tertiary care center.

Study population: A total of 50 patients undergoing primary AVF creation between January 2025 and December 2025 were included.

Inclusion criteria

- Cephalic vein diameter 1.5–2 mm (duplex ultrasound)
- Candidates for primary AVF

Exclusion criteria

- Previous AVF in the same limb
- Central venous stenosis
- Severe arterial insufficiency

Surgical technique

High radiocephalic AVF group

- Proximal radial artery used
- Modified side-to-side anastomosis
- Distal vein ligation performed

- Selective intraoperative dilatation using fistula probe

Brachiocephalic AVF group

- Standard end-to-side anastomosis at elbow
- No routine vein dilatation

Outcome measures

- **Primary:** Functional maturation at 6 weeks
- **Secondary:**

- Time to maturation
- Complications (edema, thrombosis, steal syndrome)
- Need for secondary intervention

Statistical analysis: Continuous variables were analyzed using independent t-test and expressed as mean ±SD. Categorical variables were analyzed using Chi-square test. A p-value <0.05 was considered statistically significant.

RESULTS

Baseline characteristics

Parameter	High RC (n=25)	BC (n=25)	p-value
Mean age (years)	52.4 ± 11.2	54.1 ± 10.6	0.58
Male (%)	68	72	0.75
Diabetes (%)	44	48	0.78
Vein diameter (mm)	1.7 ± 0.15	1.8 ± 0.14	0.09

Primary Outcomes

Outcome	High RC	BC	p-value
Maturation Rate	72%	80%	0.51
Time to Maturation (days)	44.2 ± 8.6	38.5 ± 7.9	0.03*

Complications

Complication	High RC	BC	p-value
Overall Complications	12%	36%	0.04*
Venous Hypertension	4%	20%	0.08
Edema	8%	24%	0.12
Steal Syndrome	0%	12%	0.07
Thrombosis	8%	12%	0.64

(*Statistically significant)

DISCUSSION

The present study demonstrates that high radiocephalic AV fistulae, when performed with optimized techniques, can achieve maturation rates comparable to brachiocephalic fistulae in patients with borderline vein diameters. Although brachiocephalic fistulae showed a trend toward faster maturation, this advantage was offset by a significantly higher complication rate [5]. The absence of steal syndrome and lower incidence of venous hypertension in the high RC group highlight its hemodynamic safety [6].

Technique optimization likely contributed to improved outcomes. Modified side-to-side anastomosis provides a larger anastomotic surface, while distal vein ligation ensures directed flow. Intraoperative dilation may assist in overcoming functional narrowing in small veins [7].

These findings support the principle of distal access preservation without compromising clinical outcomes.

Limitations

- Small sample size
- Retrospective design
- Short follow-up duration
- Single-center study

CONCLUSION

High radiocephalic AV fistula using optimized surgical techniques offers comparable maturation outcomes to brachiocephalic fistula in borderline veins, with fewer complications and better preservation of future vascular access sites.

Ethics Statement: The study was conducted in accordance with institutional ethical standards. Patient confidentiality was maintained, and informed consent was waived due to the retrospective nature of the study.

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