



A Comparison of survival and quality of arteriovenous fistula between local anesthesia and axillary block methods

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Abstract

Introduction: Vascular access for dialysis is considered the biggest challenge for chronic dialysis patients, and arteriovenous fistula (AVF) is still the best way to provide vascular access for dialysis. In the present study, survival and quality of AVF was compared between local anesthesia and regional block techniques.

Methods: The present study recruited patients with end-stage renal disease (ESRD) undergoing hemodialysis through AVF in 2014-2015. The subjects were randomly divided into local anesthesia (A) and axillary block (B) groups, and received AVF in the antecubital region. The AVF patency and flow were compared between the two groups both long-term and short-term. Data was analyzed in SPSS software.

Results: In the present study, 60 patients with ESRD and candidates for AVF creation were divided into local anesthesia (A) and axillary block (B) groups of 30 people. Patients' mean age was 54.28 [standard deviation (SD) = 14.45] years. No significant difference was observed between the two groups in mean AVF flow and patency 24 hours, 10 days, and 6 months after the surgery. Gender had no effect on AVF flow in the two groups. However, AVF flow was significantly lower in patients with diabetes and ischemic heart disease (IHD).

Conclusion: The results obtained showed no significant difference in AVF flow and patency between local anesthesia and axillary block both in the short-term and long-term. Diabetes and IHD significantly reduced AVF flow.

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Introduction

Vascular access for dialysis, the biggest challenge for chronic dialysis patients, can be best achieved through arteriovenous fistula (AVF). The Society for Vascular Surgery (SVS), USA, has reported that the use of the patient's own vein to provide vascular access for dialysis leads to a dramatic reduction in mortality and morbidity of patients.¹ The SVS has recommended radiocephalic fistula at the wrist as the first choice, but unfortunately, most patients lack suitable veins in this area.

Therefore, the second best choice is brachiocephalic fistula in the antecubital region.¹

Considering the poor health conditions of patients with end-stage renal disease (ESRD), an alternative method to general anesthesia should be used for AVF. However, since embedding AVF may require replacement and use of an alternative vessel, frequent and high doses of medication may be need for local anesthesia, and thus, regional block could produce better results.² In their study,

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Lo Monte et al. compared local anesthesia with lidocaine and regional block with bupivacaine, and observed significant venous dilatation and reduction in pulsatility index (PI) in the regional block group compared to the local anesthesia group.³ In many studies, supraclavicular⁴ and infraclavicular⁵ regional blocks have produced similar results. In the present study, local anesthesia and regional block techniques were compared in terms of AVF flow and patency.

Methods

The present study recruited patients with ESRD undergoing hemodialysis via AVF in 2014-2015. A sample size of 30 in each group was sufficient to detect a clinically important difference of 70 points (between the intervention and control groups) on the AVF flow 6 months after the surgery, assuming a standard deviation (SD) of 100 and 94 points for intervention and control groups, respectively, using a two-tailed t-test of the difference between means, a power of 80%, and a significance level of 5%. The calculation was based on the assumption of the normal distribution of the measurements on AVF flow (Equation 1).

$$n_A = \frac{2(Z_{1-\alpha/2} + Z_{1-\beta})^2 \sigma^2}{d^2} \quad \text{(Equation 1)}$$

Patients were randomly divided into local anesthesia group (A) [receiving lidocaine 2% (3 cc to 5 cc)], and axillary regional block (B) [receiving lidocaine 1.5% (20 cc to 30 cc)]. Both groups then underwent AVF creation in the antecubital region. The study inclusion criteria consisted of lack of vascular diseases in the upper limbs, presence of proximal and distal pulse, no history of vascular thrombosis, and no infection at the injection site.

After local anesthesia, a transverse incision was made about 2 cm below the antecubital fossa where brachial pulse was felt. Brachial artery anastomosis to a suitable adjacent vein was performed end-to-side or side-to-side using proline 7-0 suture. Subsequently, patency of fistula was checked by ensuring presence of thrill and bruit.

Follow-up included examination and Doppler ultrasound of AVF site 24 hours, 10 days, and 6 months after surgery (Figure 1).

Data were analyzed in SPSS software (version 22, IBM Corporation, Armonk, NY). In descriptive analysis, mean and SD was used for quantitative data and frequency percentage for qualitative data. In deductive analysis, t-test and chi-square were used. Significance level was considered less than 0.05.

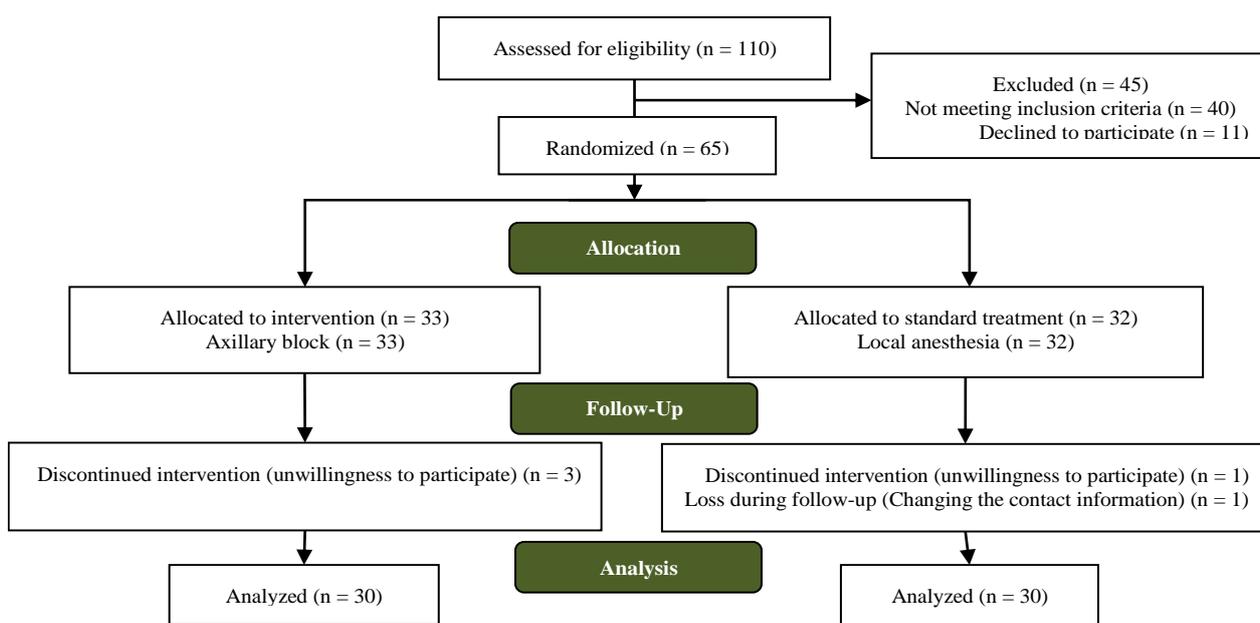


Figure 1. Flowchart of Study

Patients were not charged for this study, and informed written consents were obtained from them. Patients unwilling to take part were excluded. The results obtained were reported anonymously, and patients' personal data remained confidential.

Results

In the present study, 60 patients with ESRD and candidates for AVF creation were randomly and equally divided into local anesthesia (A) and axillary block (B) groups. Patients' mean age was 54.28 (SD = 14.45) years. No significant difference was found in terms of mean age between local anesthesia and axillary block groups (56 years V 52.5 years) ($P = 0.353$). Of the total number of participants, 29 (48.3%) were women and 31 (51.7%) were men, and no significant difference was found between the two groups in terms of gender distribution (40.0% women in group A and 56.7% women in group B) ($P = 0.151$).

Mean duration of illness was 52.14 months in group A and 57.6 months in group B, with no significant difference between the two groups ($P = 0.657$). In terms of underlying diseases, 40% of patients in group A and 26.7% in group B had diabetes ($P = 0.206$), and 20% of patients in group A and 23.3% in group B had ischemic heart disease (IHD) ($P = 0.500$). Moreover, 76.7% of patients in group A and 73.3% of patients in group B had hypertension ($P = 0.500$).

Mean AVF flow 24 hours after surgery was 851 (SD = 427.4) ml/minute in group A and 755.83 (SD = 455.22) ml/minute in group B ($P = 0.407$). Mean AVF flow 10 days after surgery was 895 (SD = 464.52) ml/minute in group A and 727.5 (SD = 381.50) ml/minute in group B ($P = 0.132$). Mean AVF flow 6 months after surgery was 809.23 (SD = 478.90) ml/minute in group A and 746.54 (SD = 453.34) ml/minute in group B ($P = 0.630$).

AVF failure was observed in 1 case in the local anesthesia group and 4 cases in the axillary block group, with no significant difference between them ($P = 0.177$).

AVF flow was not affected by gender, but it was significantly lower in patients with diabetes and IHD compared to others.

Discussion

Type of anesthesia procedure can affect AVF success.⁶ General anesthesia is a suitable technique for AVF, but leads to reduced blood pressure and cardiac output, which can adversely affect AVF success by reducing AVF flow.⁷ Local anesthesia and brachial block are suitable alternatives with less effect on cardiovascular and pulmonary systems.⁸ Due to tissue acidosis and prolonged increased tissue blood flow in chronic renal failure (CRF), local anesthesia is less effective compared to other methods.⁹

In the present study, the results of AVF creation in local anesthesia and regional block methods were compared. The two groups matched in terms of age and gender, and no significant difference was found between them in underlying diseases such as diabetes, hypertension, and IHD. It seems that the strength of this study was that one surgeon and anesthesiologist performed all operations and its weakness was its relatively low number of patients.

The results obtained showed no significant difference in AVF flow and patency between local anesthesia and axillary block groups. However, AVF flow was significantly lower in patients with diabetes and IHD. Nevertheless, gender had no effect on AVF flow.

In a study by Macfarlane et al.¹⁰ comparing local anesthesia and forearm block in AVF prognosis, forearm block produced better AVF prognosis. Another study showed that two-year AVF survival was 52% in local anesthesia and 93% in brachial block.¹¹

However, axillary block may cause certain complications due to vascular proximities. In a case study on a patient receiving axillary block, traumatic axillary AVF was created.¹²

In a study on Bier block (intravenous regional) anesthesia in patients undergoing AVF, Kazemzadeh et al. observed the most vasodilatation in these patients.¹³ Sahin et al.

investigated the effect of ultrasound guided infrabrachial block on AVF flow after surgery, and showed that radial arterial and AVF flows in patients under infraclavicular block were higher compared to patients under local anesthesia.⁵

In another study, Elsharawy and Al-Metwalli found no significant difference between general and regional (brachial block) anesthesia in short-term AVF prognosis.¹⁴

Conclusion

It can be concluded that anesthesia methods cannot change the outcome and patency rate of AVF.

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Authors' Contribution

Nasser Malekpour: Application, method and material writing, corresponding author

Navid Nuraei: Application, data gathering and analysis.

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Conflict of Interest

Authors have no conflict of interest.

Ethical Approval

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