# Beyond the Conventional: Non-Conventional Techniques for Radio-Cephalic Arteriovenous Fistula

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**Introduction**

The growing need for hemodialysis for End-Stage Kidney Disease (ESKD) demands reliable vascular access as a fundamental tool and a means of establishing a connection between patients' blood vessels and extracorporeal circulation. For this purpose, among the various types of vascular access options, including arteriovenous grafts and central venous catheters, arteriovenous fistula (AVF) is considered an optimal first choice, showing superior outcomes and low incidence of infection, hospitalization, thrombosis, and mortality compared to other vascular access options. Among various types of AVF, distal autogenous radio-cephalic arteriovenous (RC-AVF) is considered a gold standard, reducing the incidence of steal syndrome compared with elbow fistulas and simultaneously preserving more proximal vessels for future access placement. Therefore, functional RC-AVF is a highly desired outcome for hemodialysis patients.

**Problem**

Despite these favorable outcomes, the main barrier to increasing the prevalence of RC-AVF among patients treated with hemodialysis is its high primary and secondary failure rate due to juxta-anastomotic stenosis, thrombosis, and failure to mature as demonstrated by a meta-analysis showing about only 62% patency rate of RC-AVF in one year. Surgical techniques have been identified as contributing factors to AVF failure. The conventional method of creating an RC-AVF has shown low patency rates, with some studies reporting the primary patency rate as low as 44%. The suboptimal patency rates observed in fistulas with conventional techniques lead to frequent interventions to restore their functionality. This involves either revising and repairing the existing fistula or abandoning it altogether and resorting to surgery using proximal vessels. Such interventions limit the available options for future vascular access. Moreover, this not only significantly impacts the quality of life for patients but also places a substantial burden on both individuals and the healthcare system. These repetitive procedures also incur high costs and contribute to decreased patient compliance, further exacerbating the challenges faced by both patients, and the healthcare system.

**Solution**

To overcome these challenges, innovative approaches like the No-Touch Technique (NTT) and Modified No-Touch Technique (MNTT) have been introduced for RC-AVF creation. No touch technique, a well-established technique used in cardiac surgery during the harvesting of saphenous venous graft for the coronary bypass has shown better graft patency rates. Given its successful implementation in cardiac surgery, this approach has been adapted for RC-AVF creation. In contrast to conventional techniques that involve removing the perivenous vascular tissue around the cephalic vein, this approach focuses on preserving the perivascular tissue surrounding the cephalic vein. By avoiding direct contact with the radial artery and cephalic vein, preserving the vasa vasorum, and preventing complications like kinking and spasms, the NTT minimizes surgical trauma and may impede the early development of intimal hyperplasia. Furthermore, the presence of perivenous adipose tissue offers additional benefits in terms of increased patency rates for RC-AVF compared to the conventional technique. The continuous release of relaxing factors by adipocytes may contribute to improved vascular function. Additionally, the presence of perivenous adipose tissue, which is associated with reduced inflammation and specific biochemical factors, could further enhance the patency of RC-AVF.

To further improve success rates and minimize the risk of complications, a modified version of NTT, the MNTT has been introduced where, in addition to preservation of perivenous vascular tissue, a side-to-side anastomosis between artery and vein is performed instead of end-to-side anastomosis. This modification reduces turbulent flow and decreases the risk of juxta-anastomotic stenosis encountered with end-to-side anastomosis.

**Cost:**

The implementation of NTT and MNTT for RC-AVF creation offers promising solutions to address the challenges associated with conventional techniques. Unlike the conventional technique, which has demonstrated suboptimal patency rates and necessitates frequent interventions, the NTT and MNTT present a paradigm shift in surgical approach.

It is noteworthy that the adoption of the NTT and MNTT techniques does not necessitate significant additional financial resources or infrastructure modifications. Instead, the successful implementation of these techniques primarily relies on the cultivation of specialized skills and techniques among healthcare professionals involved in vascular access procedures. By enhancing their proficiency in performing these non-conventional techniques, healthcare providers can optimize the outcomes of RC-AVF creation and mitigate the burden associated with subsequent interventions and procedures.

While the advancement of skills may require dedicated training programs and ongoing education, the long-term benefits outweigh the investment. By reducing the primary and secondary failure rates of RC-AVF and minimizing the need for revision or abandonment of fistulas, the NTT and MNTT techniques not only improve patient outcomes and quality of life but also contribute to significant cost savings for both individuals and the healthcare system.

**Conclusion:**

In conclusion, the No-Touch Technique (NTT) and Modified No-Touch Technique (MNTT) have emerged as promising alternatives to the conventional method of creating radio-cephalic arteriovenous fistulas (RC-AVF).

While the existing literature on NTT and MNTT has shown encouraging results, further studies are warranted to solidify their efficacy and establish their role as the future of RC-AVF creation. Additional research should focus on validating the benefits of these techniques in larger patient populations, comparing them to conventional approaches, and evaluating long-term outcomes. Moreover, prospective studies that assess the impact of specialized training programs for healthcare professionals in performing NTT and MNTT are essential to ensure widespread adoption and success.

By supporting the existing literature with robust evidence, we can enhance our understanding of the NTT and MNTT techniques and their potential advantages. These techniques have the potential to transform the landscape of RC-AVF creation, leading to improved patient outcomes, reduced healthcare costs, and enhanced quality of life for individuals with end-stage kidney disease.