

PREVENTION BETTER THAN CURE?
AVOIDING STEAL SYNDROME WITH PROXIMAL RADIO/ULNAR
ARTERIO-VEINOUS FISTULAE

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INTRODUCTION – Steal syndrome remains a significant complication following arterio-venous fistula (AVF) formation. The prevalence of this phenomenon has been quoted as being as low as 1% and up to 20% with a higher incidence attributed to brachial compared to forearm fistulae. Symptoms range from mild numbness to rest pain and gangrene.¹⁻⁴ Management of this condition has been variable, sometimes leading to ligation of the fistula and loss of the vascular access, or revision of the fistula by banding or DRIL procedure, with a subsequent uncertain outcome.¹⁻⁶ Can steal syndrome be avoided rather than treated?

Toledo-Pereyra et al. first performed proximal radial artery-cephalic vein AVF in 1977 with excellent results. However, the population on which they would have operated would have been much younger, with less co-morbidities than the current patient cohort – is this procedure useful, therefore, in today's population?⁷

METHODS - All patients who underwent proximal radial or ulnar artery AVF, under the care of one surgeon in the Department of Transplant Surgery at the Royal Liverpool University Hospital between 2003 and 2007, were evaluated retrospectively, using hospital dialysis records, outpatient review and telephone interviews with patients. In the early part of this period, only a few patients were selected to undergo proximal radio-cephalic fistulae but

latterly, a conscious effort has been made to avoid performing brachial fistulae in favour of proximal radial or ulnar based fistulae.

SURGICAL TECHNIQUE

A longitudinal incision below the antecubital fossa is made since the site of the brachial bifurcation is unpredictable. The median cubital vein, or a branch thereof was used in most cases in order to reach the proximal radial or ulnar artery. Most were end vein to side artery anastomoses although occasionally a side to side anastomosis was performed. Latterly, most of our patients underwent pre-operative duplex scanning, in order to select the most appropriate site for the fistula, whether wrist or elbow. We always prefer to perform a radio-cephalic fistula at the wrist as the primary procedure, using the proximal site only if the fistula occludes or the vein is smaller than 1.8mm in diameter.⁸ No actual measurements of the proximal radial or ulnar arteries were obtained.

RESULTS – There were 56 patients who underwent AVF using proximal radial or ulnar artery as inflow. 34 were male and 22 female. The median age of patients was 60 years (range 19-85 years). Eight patients (14%) were diabetic; of these 6 were insulin dependant. 28 patients had had one or more previous fistulae which had failed, therefore, this was a primary procedure for 28 (50%).

The proximal radial artery was used for inflow in 49 cases (88%) and the ulnar artery in 7. The choice of vein varied between the cephalic (14), median cubital (33) and median basilic (8). PTFE graft was used as a substitute for native vein in one patient. Three fistulae (5%) failed in the first week, 3 others failed to mature or occluded later, before use – making an 89% successful primary patency rate. 3 fistulae failed after having been used for a year or more – giving a long term patency rate of 84%. 4 patients (7%) underwent a further procedure to narrow the median basilic vein, thus increasing the flow in the functioning fistula.

However, not all patients used their fistulae - 3 patients received a renal transplant, 2 patients decided on peritoneal dialysis, 4 patients remain pre-dialysis, 6 fistulae are maturing and 2 are mature and awaiting needling but all of these have good function. 16 patients (29%) have died, of these 13 had functioning fistulae. Therefore, 17 fistulae (30%) are being used currently for haemodialysis.

One insulin dependent diabetic patient, an arteriopath with bilateral above knee amputations, developed steal syndrome which was detected at a late stage when he had finger ulceration and it was decided to ligate the fistula, rather than consider revision. Thus, the overall incidence of steal syndrome was only 2%.

DISCUSSION – Native arterio-venous fistulae are the gold standard in vascular access for haemodialysis as they offer better patency rates and less infection than prosthetic equivalents.^{4,9-12} Traditionally the first access procedure of choice is a radio-cephalic fistula at the wrist, followed by a brachio-cephalic at the elbow, if the vein or artery at the wrist are not suitable, or the fistula fails. Subsequent to this, the options were transposition of the basilic vein – or a prosthetic graft. As the age of the population increases and patients with ESRF have more co-morbidities, such as diabetes, obesity and atherosclerotic disease, the challenge of vascular access becomes more difficult and consideration of alternative procedures is a vital step in ensuring successful, long term haemodialysis in these patients.⁹⁻¹² Brachio-cephalic AVF have a significantly higher risk of causing ischaemic steal syndrome than more distal procedures, but are increasingly used as the primary access procedure.^{1,2,4} Therefore an alternative type of native AVF could play a significant role in reducing this complication.

In 1977 Toleydo-Pereyra et al described the use of the proximal radial artery as an alternative inflow for AVF, specifically in patients with failed wrist fistulas and diabetics.⁷ This procedure has been re-visited by Jennings et al, who suggest that the proximal radial artery be

used as the second choice of inflow for a native AVF.^{9, 11,12} Our practice has shown that the proximal radial artery may not always be a suitable vessel, due to its small size, but the proximal ulnar artery can also be used, to good effect and with no added complications. The choice of inflow vessel can be made by the surgeon on the findings of pre-operative Duplex ultrasound scanning, or at the time of surgery, with direct visualisation and assessment of the calibre of these vessels. Our previous paper suggested that a minimum arterial diameter of 1.6 mm was necessary for successful AVF.⁸

CONCLUSION – Our experience suggests that arterio-venous fistulae using proximal radial or ulnar arteries should be performed before brachio-cephalic fistulae since they offer long-term patency and reduced incidence of steal syndrome. To our knowledge, we are the first centre to perform ulnar artery-based fistulae on a regular basis. The option of performing brachio-cephalic AVF subsequently remains available if necessary; therefore this procedure offers another option for surgeons performing vascular access surgery for haemodialysis patients.

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