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MANAGEMENT OF ISCHEMIC STEAL IN AV ACCESS - A CASE REPORT REVIEW OF LITERATURE

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Abstract :
Ischemic steal syndrome (ISS) associated with arteriovenous (AV) access is rare but has the potential to result in severe complications. Distal revascularization and interval ligation (DRIL) is a surgical procedure, which has been used to treat such patients with ischemia secondary to arterial steal from dialysis accesses. Here we present the case details of a young girl who developed steal symptoms in the left upper limb after left brachiocephalic fistula creation and was successfully managed with DRIL procedure. We also review the literature regarding the incidence of ISS after AV access and outcomes of DRIL for its management.
Keyword : Ischemic steal syndrome, AV access, DRIL procedure

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ABSTRACT Ischemic steal syndrome (ISS) associated with arteriovenous (AV) access is rare but has the potential to result in severe complications. Distal revascularization and interval ligation (DRIL) is a surgical procedure, which has been used to treat such patients with ischemia secondary to arterial steal from dialysis accesses. Here we present the case details of a young girl who developed steal symptoms in the left upper limb after left brachiocephalic fistula creation and was successfully managed with DRIL procedure. We also review the literature regarding the incidence of ISS after AV access and outcomes of DRIL for its management.
Key words - Ischemic steal syndrome (ISS), AV access, DRIL procedure CASE DETAILS We present the details of a 21 year old female Indian patient. She was diagnosed to have chronic kidney disease (CKD) stage V and underwent left brachiocephalic fistula 2 months before presentation. She presented with complaints of rest pain & paraesthesia of left hand and

forearm for 1 month with aggravation of symptoms during dialysis. Physical examination revealed a healed surgical scar in the left cubital fossa with thrill. The radial and ulnar artery pulses on the left hand were absent and there was mild wasting of the forearm and hand. On occluding fistula, distal pulses reappeared. Duplex evaluation ruled out any proximal and distal arterial disease. After systemic evaluation, she underwent distal revascularization and interval ligation. Through a cubital fossa skin incision, controls were taken over the brachial artery both proximal and distal to the site of the arteriovenous fistula (AVF). Great saphenous vein was harvested from the leg. A bypass was created from the proximal part of the brachial artery to a segment of artery distal to the site of the AVF. The brachial artery just distal to the AVF was ligated. Postoperatively, she had good relief of symptoms and was able to tolerate further dialysis sessions through the functioning brachiocephalic fistula. At three months after the procedure, she was asymptomatic for steal symptoms and the AVF was functioning well. Unfortunately, she expired due to a cardiac complication.

DISCUSSION:

Ischemic steal syndrome (ISS) occurs when distal arterial ischemic symptoms develop secondary to the placement of arteriovenous grafts or fistulas. In essence, the more proximal dialysis access steals the arterial inflow through the low-resistance shunt, creating arterial insufficiency to the extremity, which can lead to symptoms of claudication, numbness, paresthesia, motor dysfunction, pain, or tissue loss. Additionally, the dialysis access can exacerbate these ischemic symptoms by reversing the flow in the native artery away from the forearm and hand. The lack of sufficient collaterals is an additional factor that contributes to the development of ischemic symptoms in the hand and fingers. The incidence of hand ischemia requiring further surgical intervention is between 5 to 8%. Many surgical options have been described for the treatment of DASS. The distal revascularization interval ligation (DRIL) procedure gained popularity for this condition. DRIL procedure has been shown to have a high clinical success rate. Additionally, the existing dialysis access is not sacrificed and can continue to be used, thus, a new dialysis access site does not need to be created. Many risk factors for the development of dialysis-associated steal syndrome have been described. A history of access-related hand ischemia and diabetes are two of the strongest predictors for the development of subsequent arterial insufficiency to the extremity. Steal is more likely when the access is placed above the brachial artery trifurcation. Other risk factors such as advanced age, female sex, peripheral arterial occlusive disease, large conduits such as femoral or popliteal veins, or history of multiple prior procedures have also been described. During the placement of the initial dialysis access, an intraoperative digital-brachial index of less than 0.45 is also a risk factor for the subsequent development of hand ischemia. The procedure was originally described by Schanzer et al in 1988 after a small case series of three patients. Schanzer later published a series of 14 cases in 1992 and 23 cases in 1996. In the last series, all 23 patients showed clinical improvement of their dialysis-associated ischemic symptoms and demonstrated a 95.6% patency at 2 years. In 1994, Tynan-Cuisinier and Berman coined the acronym DRIL. At that time, they published the largest series of patients and showed a 90% relief of symptoms with healing of ulcers or ischemic lesions. They also demonstrated a

12-month patency of 40 to 50% when grafts were used and 80% patency when native veins were used. The DRIL showed a 48-month patency of 80%.

The proximal anastomosis for the DRIL bypass is placed greater than or equal to 7 cm proximal to the takeoff of the dialysis access. The native brachial artery is ligated just after the takeoff of the dialysis access. The distal anastomosis of the DRIL bypass is inserted in the native artery in an end-to-end or end-to-side fashion just distally to the ligated native artery. The greater saphenous vein is used preferentially for the bypass conduit. Other choices would include an arm vein, femoral vein, or cadaveric vein. Using a prosthetic graft is generally the last option. Recently, Huber et al reported the largest series of DRIL cases describing 64 procedures in 61 patients. A DRIL was performed on 19% of the cases less than 24 hours after the initial creation of the dialysis access. The majority of the DRIL creations (44%) were performed greater than 30 days after the initial dialysis access placement. The DRIL relieved symptoms in 78% of the cases. The perioperative mortality was 3% and the complication rate was 22%, with wound infection the most common accounting for 14%. Primary patency rates of 77%, 74%, and 71% and secondary patency rates of 81%, 76%, and 76% were achieved at 1, 3, and 5 years, respectively. Advantage of the procedure is that the dialysis access can continue to be used in an uninterrupted fashion after surgery. The dialysis access is not sacrificed and catheter placement for dialysis is avoided. One of the main disadvantages of the DRIL procedure is that the native artery is ligated and perfusion to the forearm and hand are dependent on a bypass conduit and potentially collaterals. Despite this concern, no cases of limb ischemia secondary to bypass graft failure have been reported.

OTHER TREATMENT OPTIONS Revision using distal inflow procedure (RUDI) was described by Minion et al. In the RUDI, the dialysis access is ligated proximally just after the arterial anastomosis. A bypass graft is created from a smaller more distal artery such as a radial or ulnar to the dialysis access. This anatomy leaves the perfusion to the forearm and hand intact and only potentially places the dialysis access at risk if the bypass occludes.

Proximalization of the arterial inflow is another procedure that has been described, which is performed by moving the arterial anastomosis proximally from the brachial artery to the axillary artery by using a bypass graft. The more proximal arterial anastomosis should increase the flow to the forearm by increasing pressure at the split point between the arm and the dialysis access. As the arterial anastomosis is higher in the arm, collateral flow begins at a higher point in the arm, which should also be advantageous to help prevent ischemic symptoms to the hand. The surgery is quicker than a DRIL as a conduit vein does not have to be harvested for the surgical bypass. This procedure has limited clinical experience, but is an alternative for surgeons who are reluctant to ligate the native artery.

Narrowing the arterial anastomosis of the dialysis access has also been described using a banding technique.

The premise is that banding will increase the fistula resistance, which will indirectly increase perfusion to the extremity distal to the fistula.

Unfortunately, the results have been inconsistent as it has been difficult to achieve a balance between increasing resistance in

the dialysis access and accidental access thrombosis. If the band is too loose, there will be no change in symptoms. If the band is too tight, thrombosis of the dialysis access occurs. The dialysis access can also be narrowed by the **MILLER technique**, which uses a balloon to serve as a template for the Miller ligature to narrow the dialysis access. Recently, Zangan and Van Ha described using a **constrained Wallstent®** (Boston Scientific, Natick, MA) narrowed to 4 mm by a suture as a minimally invasive technique to increase resistance within the fistula for the treatment of dialysis access steal.

CONCLUSIONS:

Significant dialysis access induced ischemia is rare. This case illustrates that the DRIL procedure has good results in reversal of such steal symptoms.Moreover with this procedure, the AV access can be salvaged.

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