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Optimal management of central vein disease in hemodialysis patient

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Optimal Management of Central Vein Disease in Hemodialysis Patient **Anil K. Agarwal, MD**

A well-functioning hemodialysis (HD) arteriovenous (AV) access is essential to provide adequate dialysis. Obstruction to outflow due to venous stenosis commonly occurs in peripheral veins although the central (intracavitary) veins can also be involved. The major intrathoracic veins including subclavian vein, innominate vein, and superior vena cava are considered the central veins in the upper extremity, whereas the iliac veins and inferior vena cava are the central veins for the lower extremity. Stenosis or occlusion of the central veins makes the establishment of an AV access in that extremity very difficult and is also associated with increased morbidity, hospitalization, and mortality.

Etiology

Central vein stenosis (CVS) is caused primarily by previous or current use of central venous devices including central venous catheters (CVC), peripherally inserted central catheters (PICC), and cardiac rhythm devices (CRD). Higher number, longer duration of CVC placement, subclavian location, and left-sided placement increase the risk of developing CVS.

Clinical Presentation

Central vein stenosis may be asymptomatic and detected incidentally during evaluation of a dysfunctional vascular access. The symptoms of edema, swelling, pain, tenderness, erythema of the ipsilateral extremity, ipsilateral breast swelling and pleural effusion can be the presenting features. Bilateral stenosis of the innominate veins or the superior vena cava (SVC) can lead to the features of SVC syndrome. Poor adequacy of dialysis, high intra-access pressure with prolonged bleeding after dialysis, aneurysm formation, collateral development and thrombosis of the access can also occur.

Diagnosis

Angiography is the gold standard for diagnosis of CVS. In high-risk patients, angiography is superior to duplex ultrasound in screening for CVS prior to the placement of new access. CT venography is an effective tool in defining CVS in selected cases, especially prior to aggressive interventions for recanalization.

Management

Asymptomatic CVS is better left alone, due to the likelihood of acceleration of CVS by the trauma of intervention. Mildly symptomatic CVS can be dealt with conservatively, by elevating the extremity to relieve edema in anticipation of development of collaterals. Associated thrombosis may require anticoagulation. Moderate to severe CVS requires a multifaceted and multidisciplinary approach utilizing locally available expertise.

Endovascular Intervention

Percutaneous transluminal angioplasty (PTA) alone is the initial recommended approach. Angioplasty results are highly variable and the technical failure rate ranges from 10% to 30%. Patency rates

after PTA alone are generally poor (28.9% at 180 days, and 25% at 1 year).

PTA with stent placement is recommended for elastic vein recoil leading to significant residual stenosis after PTA or for lesions recurring within 3 months after angioplasty. Wallstents have shown better outcomes than stainless steel stents. However, the primary patency of stents is disappointing (approximately 25% at 1 year) and secondary patency of stents is modest, variable requiring multiple interventions (ranging from 50% to 90% in most studies). Use of covered stents (stent grafts or endografts) offers a relatively inert surface and less likelihood of restenosis than the bare metal stents. Drug eluting stents have shown better patency recently. Development of more biocompatible stents with better patency rates will require innovation.

A hybrid graft-catheter device can traverse the central venous stenosis and is anastomosed to a new or previously existing AVG. Patency and infection rates have been comparable to those of AVG.

Recanalization followed by PTA, and stent placement is a more aggressive (and riskier) approach to occluded/near occluded central veins and exhausted vascular access. Traditional approaches using wires and needles can now be bolstered by the use of radiofrequency wire for recanalization, followed by angioplasty and stent placement. A new 'inside-out' device has also become available. Expertise in advanced techniques is crucial for such interventions.

Surgery

Surgical repair of CVS offers better patency rates than endovascular intervention, but requires claviclectomy or sternotomy. It can be considered when other accesses are exhausted and endovascular treatment is ineffective. Direct repair of CVS can be done either by patch angioplasty or by a saphenous vein graft or ringed PTFE graft bypass. Subclavian vein stenosis can be bypassed by a jugular vein turndown. Other vein-to-vein (e.g., axillary to jugular vein) or vein to right atrium anastomoses are sometimes needed.

In severely symptomatic and refractory CVS, it may be necessary to occlude the access manually, by a balloon, or by surgical ligation, although precision banding to reduce inflow may be useful in selected cases to save the AV access.

Prevention

Avoidance of CVC and PICC lines, judicious use of CRD, development of more effective epicardial pacemakers, and possible innovation in catheter technology can minimize the risk of CVS. Pharmacologic approaches to reduce inflammation, development of fibrotic response, thrombosis and infection need to be explored. The fistula first approach combined with focus on 'catheter last' approach holds the key to better access outcomes.