

Aggressive Multi-Modality Approach to Acute Effort Vein Thrombosis

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Contemporary treatment of subclavian vein effort thrombosis usually involves multimodal therapy with catheter delivery of lytic therapy directly into the thrombus followed by surgical decompression of the thoracic outlet. Controversy exists as to the appropriate timing of surgery after initial lysis, the extent and the approach to thoracic inlet decompression, whether to deal with residual defects in the subclavian vein, and whether to correct these defects by direct repair or by catheter based techniques. Since 2001, we have treated 18 consecutive patients presenting with acute subclavian vein effort thrombosis with an aggressive policy of catheter directed lytic therapy, followed immediately by infraclavicular trans-sternal first-rib resection and open repair of the subclavian vein with saphenous venoplasty closure.

Mean duration of lytic infusion was 42 hours. Recently, the Angiojet has been used to promote more rapid lysis. In our experience, even when central flow in the subclavian vein is reestablished, significant residual intraluminal defects are invariably present on the final venogram. Five patients underwent post-lytic balloon venoplasty of the stenotic subclavian vein at outside institutions prior to transfer for surgery, all with no effect.

The chest incision follows the upper margin of the second rib from the mid-clavicular line to the midline and then angles up into the sternal notch. With separation of the clavicular and sternal heads of the pectoralis major muscle, the chest wall at the first intercostal space is exposed. Upward retraction of the clavicular head of pectoralis major allows palpation of the first rib and excision of the subclavius muscle. Cautery dissection along the inferior aspect of the first rib separates the intercostal muscles and gentle dissection on the posterior aspect of the rib allows the endothoracic fascia and pleura to fall away. The first rib is transected with a microsagittal saw at the anterior costochondral junction. The sternum is then divided in the midline from the sternal notch inferior for 2.5 to 3.0 cm, then horizontally to the upper insertion point of the second costal cartilage. Self-retaining retractors elevate the sternoclavicular junction with attached sternal segment and clavicle giving excellent exposure of the entire subclavian and innominate veins and the detached first rib. Dissection along the superior aspect of the first rib now divides the anterior, middle, and posterior scalene muscle attachments. Posterior division of the rib at the proximal neck is then accomplished allowing removal of the entire first rib.

The entire circumferences of the subclavian vein, the innominate vein, and the junction of the internal jugular vein, are dissected, with care taken to avoid the phrenic nerve. The subclavian vein is opened longitudinally with the incision carried onto the innominate vein. After dealing with the intraluminal pathology, the narrowed sclerotic region of the vein is widened with a saphenous vein patch venoplasty.

The bed of the resected rib is drained with a large hemovac; sternal closure is done with five to six number 5 sternal wires. Heparin is not reversed and is continued postoperatively until warfarin anticoagulation is therapeutic; warfarin is started on the first postoperative day

Despite maximal preoperative lytic therapy, significant residual pathology was present in all cases. All subclavian veins showed dense circumferential sclerosis of the adventitia; lysis of this scar tissue resulted in increased vein diameter. Intraluminal findings included organized thrombus densely adherent to the endothelium, sclerosis of the prominent valve at the subclavian-innominate junction with organized thrombus incorporated into the cusps of the valve, and persistent webs traversing the vein lumen. Establishing a satisfactory dissection plane between the organized thrombus and the vein wall was often challenging. Valve abnormalities and webs were treated by resection. Saphenous patch venoplasty was used to span the entire stenotic segment; this usually involved a 4 to 6 cm long patch.

The mean anesthesia time was 303 minutes, the mean surgical time was 270 minutes and mean intraoperative blood loss was 500 mL. Hemovac drains were placed for a mean duration of 3.1 days and a mean total output of 440 mL. Twenty-five percent of patients required transfusions during the perioperative period. The mean hospital length of stay was 8.1 days; there was no postoperative mortality.

Patients returned to the vascular laboratory for duplex scans using a structured protocol. Flow through the reconstructed subclavian vein was categorized as normal, abnormal or occluded in each of twelve arm-head positions. To evaluate compliance, subclavian vein diameters were measured at rest and during sustained Valsalva maneuvers. Forearm and upper arm diameters were recorded and were compared with pretreatment measurements. Questionnaires administered during vascular lab follow-up allowed patients to subjectively evaluate their clinical status at each follow-up session.

Postoperative warfarin anticoagulation was used for all patients. Seventeen patients had normal duplex studies at a mean of 3.2 months and had warfarin stopped; one patient had rethrombosis of the subclavian vein repair within a day of surgery and further efforts with lytic therapy were unsuccessful.

Sixteen subclavian veins that had open repair and venoplasty were available for study; a completely normal duplex study was found in all 12 positions in 15 veins. One patient demonstrated normal vein flow with the arm in neutral, 90°, and military positions; however, he demonstrated abnormal flow with a moderate stenosis with the arm held at 120° of abduction. At the time of presentation the symptomatic mid-upper arm circumference was on average 2.9 cm (10.5%) greater than the asymptomatic arm and the forearm maximum circumference was on average 1.8 cm (7.0%) greater on the symptomatic side. At follow-up, there was no statistically significant difference between the mean circumferences of the symptomatic and asymptomatic arms at both stations. The reconstructed veins had a mean diameter of 5.8 mm at rest and 8.6 mm with Valsalva; corresponding diameters for the asymptomatic control side were 5.1 mm and 8.5 mm. The lack of statistical difference suggests that the reconstructed veins retain compliance comparable to the unoperated side.

Follow-up questionnaires were returned by 16 patients. Overall arm function at follow-up was described as completely normal with no limitations by 13 respondents (81%) and as slightly limited by three patients. All three patients who claimed slightly-limited arm function felt they had regained the level of physical activity they were accustomed to prior to surgery.

References

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