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Single insult origin of Paget-Schroetter syndrome in adolescent successfully treated with balloon angioplasty and AngioJet thrombectomy system

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Case presentation

A 15-year-old girl presented to the emergency department complaining of a painful arm. The initial symptoms of a strange feeling in the right arm had occurred 1–2 months before hospitalization. Her legal guardian noticed significant swelling of the right extremity on the day prior to presentation. The consultant orthopedic surgeon had excluded musculoskeletal origin of the pain. Color Doppler ultrasound (CDUS) revealed massive thrombosis of the right brachial, axillary, and most of the subclavian, veins. No family history of deep venous thrombosis (DVT) and no risk factors of developing DVT were found. However, during the hospitalization it turned out that there was a history of major right upper extremity trauma three years prior to admission. Initially, anticoagulation treatment was started: nadroparin 0.6 ml subcutaneous (s.c.) twice daily. No improvement was observed for five days. After that time, a clinico-radiological meeting was conducted and the decision regarding catheter-directed thrombolysis (CDT) implementation was made. Under local anesthesia, a microcatheter was placed through peripheral 4F venous access. Initial infusion rate of alteplase of 0.3 mg/kg/h was reduced to 0.05 mg/kg/h after six hours. Over the next three days, consecutive venographies were performed. There was no possibility to access more proximal parts of the vein due to hard resistance resulting in partial recanalization of the axillary vein with poor clinical improvement. The CDT treatment was ceased. Computed tomography venography confirmed occlusion of the subclavian vein with typical pattern of multiple collateral vessels. A diagnosis of Paget-Schroetter syndrome (PSS) was made. Based on performed studies and clinico-radiological consensus, a decision was made on venous recanalization and thrombectomy with the use of the AngioJet system (Boston Scientific, USA).

The procedure was performed on hospital day 12 under general anesthesia. Additional right femoral venous access was made to guide during the crossing of the occluded subclavian vein. Initial percutaneous transluminal angioplasty (PTA) of the occluded segment was made with the use of a 3 mm balloon to allow the AngioJet system to cross the occlusion. In the next step, the brachial, axillary and subclavian veins were infused with 15 mg of alteplase using the AngioJet system equipped with a Solent Omni catheter, followed by mechanical thrombectomy using the same catheter.

In the last stage, PTA of the axillary and subclavian veins was performed with the use of increasing diameter balloons. Final venography confirmed recanalization of the treated segments with no outflow obstruction. There were no intra- or post-procedural complications. 19 days after admission to the hospital, the patient was discharged home with no symptoms and with restored flow in the treated veins, proved on CDUS. A further CDUS at three-month follow up confirmed patency of the treated veins.

Discussion

Deep venous thrombosis (DVT) in children is rare [1] with an estimated incidence of 10–14 per 10,000 pediatric

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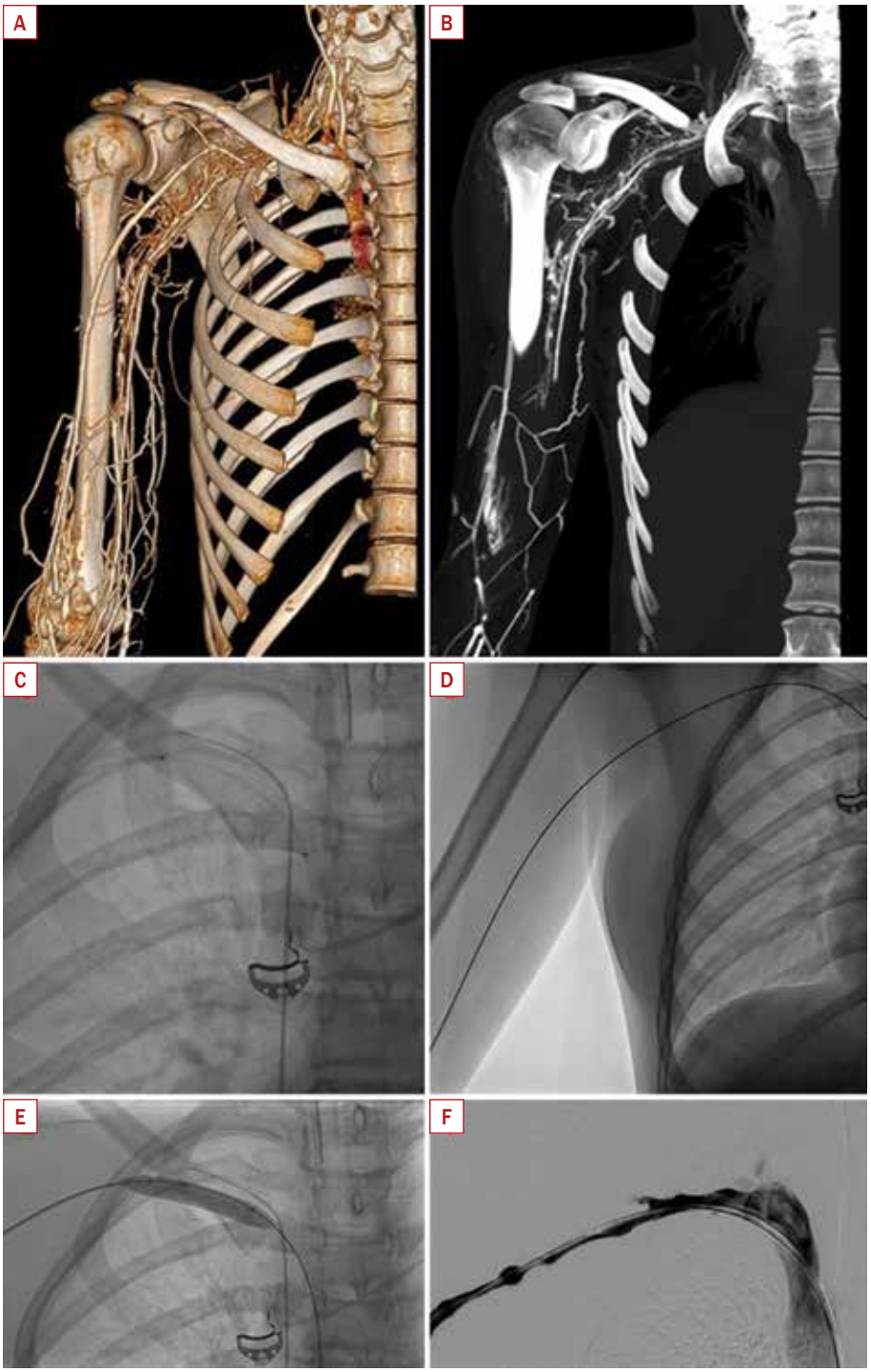

Figure 1. Computed tomography venography and interventional procedure. Three-dimensional (3D) volume rendered **(A)** and maximum intensity projection (MIP; **B)** coronal reconstruction computed tomography venography depicting occlusion of subclavian vein with typical pattern of multiple collateral vessels; **C.** Crossing of occluded subclavian vein; **D.** AngioJet system in use, markers of Solent Omni catheter visible in subclavian vein; **E.** Balloon angioplasty of subclavian vein; **F.** Digital subtraction venography presenting final result of procedure; guidewires still in place

admissions annually [2]the incidence, associated morbidity, and mortality are unknown. A Canadian registry of DVT and PE in children (ages 1 month to 18 years. There are two peaks of incidence in this population: neonates/ /infants and adolescents [3]. Although most incidences of DVT in the pediatric population are associated with central venous catheterization [3, 4], there are many other risk factors, including trauma which may lead to PSS. PSS

accounts for at least 10–20% of upper extremity DVTs, and is predominantly seen in teenagers and young adults [5].

In our patient, there was a history of prior trauma while skiing, with no data supporting chronic injury, favoring a single insult origin of PSS. Thoracic outlet decompression is considered to play a key role in the management of this syndrome. However, Lee et al. showed that only 25% of patients in whom recurrent or persistent symptoms after CTD were observed underwent surgery after a mean follow up of 13 months [6]. We found this approach to be the most suitable for our patient.

Once PSS is diagnosed, anticoagulation or CDT should be started. However, in our case, there was no response to this treatment and more invasive endovascular treatment had to be considered. Since there is a potential risk of a pulmonary embolism during recanalization of occluded veins, the decision was made to use the AngioJet system. This is a thrombectomy device with active aspiration acting by injecting heparinized saline at high-velocity, creating a strong vacuum effect using the Bernoulli effect. Another feature of this system is the power pulse mode which facilitates direct thrombus injection with thrombolytic, which was used in our patient.

Conclusions

The AngioJet system used in our pediatric patient was safe and effective. Although rare, physicians dealing with children should be aware of DVT and PSS and their potential short- and long-term complications. Once patients with DVT fail to respond to anticoagulation or thrombolysis, interventional treatment should be considered.

Authors' contributions

All authors have approved the final article.

Conflict of interest

None.

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None.

Ethics

The work described in this article has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for experiments involving humans; EU Directive 2010/63/EU for animal experiments; uniform requirements for manuscripts submitted to biomedical journals

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