

First Time Flow-Diverting Stent Placement in a Pediatric Patient through Radial Artery Approach

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Abstract

While trans-radial access (TRA) has been thoroughly described in cardiac intervention it is now in its' beginnings in the realm of cerebrovascular interventions. TRA for the purpose of cardiac intervention has been seldom described in the pediatric population and to our knowledge has never been described in the pediatric population for cerebrovascular intervention. In this case report, we aim to describe and discuss our experience with placing a flow diverting stent using TRA in a 15-year-old female with a pseudoaneurysm in the right internal carotid artery (ICA).

Keywords: *Trans-Radial Access (TRA); Internal Carotid Artery (ICA)*

Background

While trans-radial access (TRA) has been thoroughly described in cardiac intervention it is now in its' beginnings in the realm of cerebrovascular interventions. TRA for the purpose of cardiac intervention has been seldom described in the pediatric population and to our knowledge has never been described in the pediatric population for cerebrovascular intervention. In this case report, we aim to describe and discuss our experience with placing a flow diverting stent using TRA in a pediatric patient. No IRB approval was required for this case.

Case Presentation

A 15-year-old female with no past medical history was admitted after being struck by a motor vehicle. CTA revealed dissection of the right internal carotid artery (ICA). Initial Diagnostic catheter angiogram showed a non-flow limiting dissection involving the mid to distal cervical segment of the Right ICA, without evidence of any pseudoaneurysm (Figure 1). She was initially managed with anticoagulation.



Figure 1: Initial cerebral angiography showing no pseudoaneurysm.

Investigations

Three-month follow-up MRA showed moderate stenosis of the right ICA, with a new pseudoaneurysm measuring 8 mm x 5 mm x 6 mm with a 4 mm neck (Figure 2). Given the progression, flow-diverting stent placement was chosen as the optimal treatment option and TRA was considered to minimize radiation to the patient.

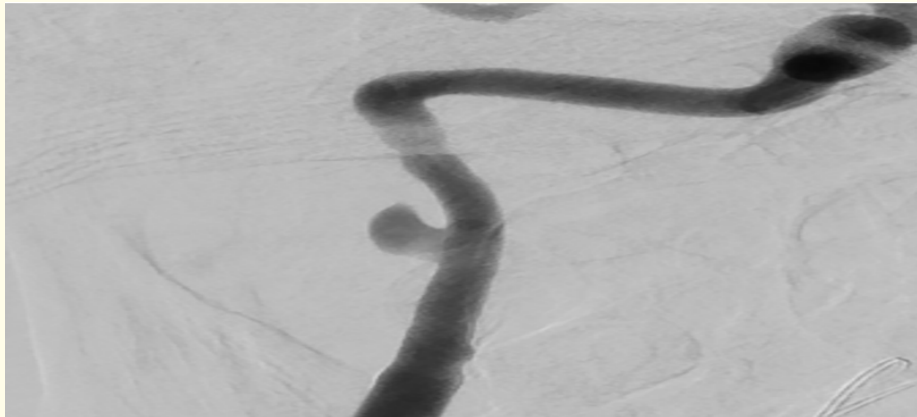


Figure 2: Follow up angiography with pseudoaneurysm in the right ICA.

Treatment

On the day of the procedure, the right radial artery diameter was measured 2.1mm with ultrasound. 2% nitroglycerin ointment and a warm pack were applied to the wrist 30 minutes prior to the procedure. On the angiography table, the wrist was elevated to body level in supine position. General anesthesia administered. Under sterile conditions, Right radial artery was punctured with 2 cm 21g needle, under ultrasound guidance using a single wall technique. A 6 french Prelude Ideal sheath (Merit Medical, South Jordan, Utah) was placed in radial artery and secured. A cocktail spasmolytics containing 2.5 mg of verapamil and 200 mcg of nitroglycerin was injected into the radial artery. Angiography of the radial artery was performed, confirming the radial artery diameter (Figure 3). Intravenous heparin bolus were given to maintain ACT between 200-300. An Envoy guide catheter (Codman Neuro, Raynham, MA) was advanced into the distal Right common carotid artery with the help of sim 2 select catheter (Penumbra Inc, Alameda, CA). Biplane angiography showed around 50% narrowing of mid to distal cervical ICA with a pseudoaneurysm in the middle of the stenosed segment. It is projecting laterally and superiorly, measuring 7.6 mm x 3.6 mm with a neck of 2.8 mm. The Synchro Soft microwire (Stryker, Fermont, CA) was navigated into the petrous portion of the internal carotid artery and the Phenom microcatheter (Medtronic, Irvine, CA) was advanced over the microwire. The navien 0.058 intermediate catheter (Medtronic, Irvine, CA) was advanced into the proximal cervical segment of the Right internal carotid artery. The pipeline embolization device (4 mm x 20 mm) was deployed under real-time fluoroscopy (Figure 4).

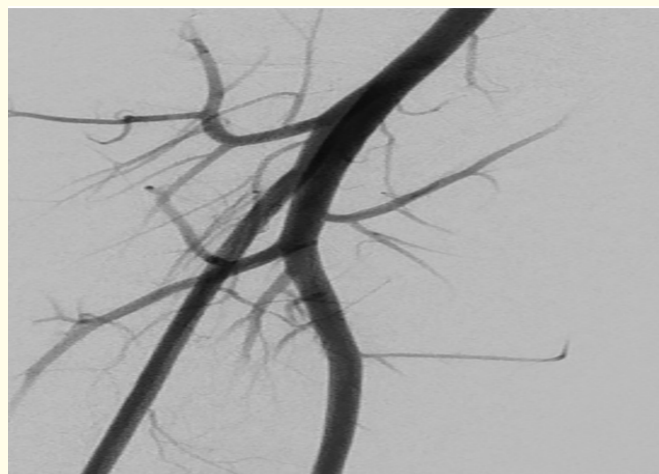


Figure 3: Radial artery angiogram.

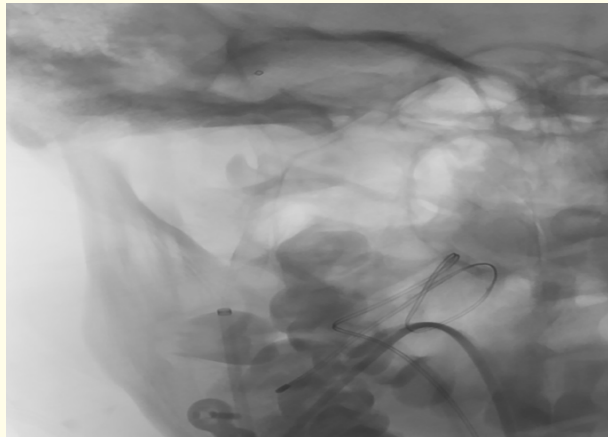


Figure 4: Deployed flow-diverting stent in the R ICA.

Outcome

Immediate and delayed Control angiograms were performed. It showed well-apposed stent covering the pseudoaneurysm, with contrast stasis in pseudoaneurysm (Figure 5). TR band was applied over the puncture site, and under the compression from TR band, radial sheath was removed (Figure 6). Excellent patent hemostasis was achieved. Starting after 30 minutes, 3cc of air was removed from TR band every 15 min, without re-bleeding or hematoma formation.

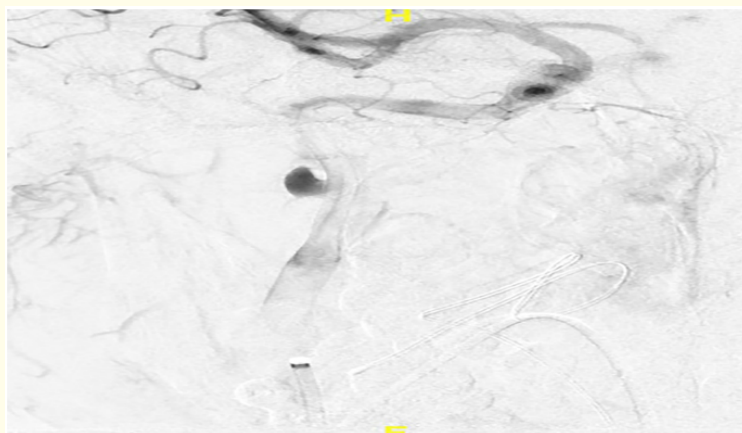


Figure 5: Stasis is shown within the pseudoaneurysm after flow-diverting stent placement.

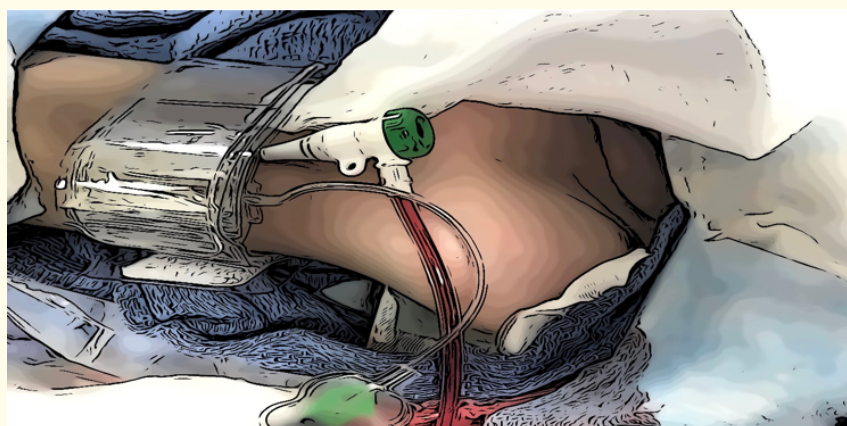


Figure 6: TR Band placement prior to removing the sheath.

Follow up

On 6 month follow up angiography the pseudoaneurysm which was previously present in the R ICA was no longer present (Figure 7). An asymptomatic pseudoaneurysm formed at the site of previous puncture at the right distal radial artery (1.2 cm x 0.7 cm). This is being followed by serial radial artery ultrasounds.



Figure 7: Six month follow up angiography

Discussion

TRA for the purposes of coronary angiography was first described in 1989 [1]. It was postulated that this technique would decrease complication rates due to dual supply to the hand by both the ulnar and radial arteries, and the fact that compression and hemostasis following the procedure were more accurate following radial access compared to brachial or femoral. Furthermore, there are no major veins or nerves near this superficially coursing artery making it a favorable target for percutaneous intervention. Early studies were done on adults for the purposes of cardiac catheterization and demonstrated that there were increased fluoroscopy times and procedural failure (mostly due to difficulty with arterial puncture) with TRA highlighting that there was a learning curve [2,3]. The studies also showed promising evidence of significantly lower complication rates with TRA as well as the advantage of immediate ambulation and early discharge. The RIFLE-STEACS study published in 2012 showed that there is a considerable decrease in mortality and complications when comparing radial to femoral approach in STEMI patients [4]. Access site bleeding was reduced by 60% and the need for transfusions as well. Again, operator experience directly affected the rate of access failure. Eventually, TRA was demonstrated to also be safe and technically just as successful as femoral approach in cerebral diagnostic angiography [5]. Recently, a paper was published illustrating the effectiveness and safety of TRA in cerebral interventions such as mechanical thrombectomy, angioplasty, treatment of aneurysms, balloon test occlusion, chemotherapy delivery, and thrombolysis [6]. In terms of drawbacks, vasospasm seems to be one of the most common complications leading to procedural failure, reported in up to 30% of cases [7,8]. Efforts to minimize vasospasm have been somewhat successful with verapamil cocktails [9]. TRA was described and first analyzed in the pediatric population in 2009 [10]. The same complications with vasospasm were also seen in this population but highlighted were the same benefits of previous trials in adults. Patient comfort during and after the procedure was increased and radial approach was highly preferred by the patient when compared to femoral. Increased levels of anxiety in children undergoing procedures cause increased vasospasm and premedication with anxiolytics was suggested to be of benefit. It was also observed that patients who underwent the procedure under general anesthesia had less vasospasm. It was again emphasized that operator experience was an important factor and reduced fluoroscopy times.

Conclusion

As experience grows and the techniques become more refined TRA for cerebrovascular procedures in general and the pediatric population will become more ubiquitous. With proper patient selection, TRA for percutaneous intervention has been shown to be safe and reduce complications while increasing patient comfort. We anticipate this will translate into safe and successful interventions in the pediatric population for cerebrovascular interventions as well.

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