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# Bilateral Radial Artery Pseudoaneurysms Associated With Bilateral Ulnar Artery Atresia: A Case Report

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Pseudoaneurysms of the radial artery are uncommon and most often localized in an area of penetrating vascular trauma or iatrogenic injury. Hypoplasia of the ulnar artery is even more rare. We report a case of bilateral radial artery pseudoaneurysms associated with complete absence of any ulnar contribution to the vascularity of the hand. A patient presented with bilateral tender masses adjacent to the anatomic snuff boxes that interfered with hand function. After confirming that these masses were bilateral radial artery pseudoaneurysms, resection of the pseudoaneurysms and microscopic reconstruction of the arterial segments preserved vascular integrity of the hands and provided relief of the patient's pain. (*J Hand Surg* 2000;25A:565-570. Copyright © 2000 by the American Society for Surgery of the Hand.)

**Key words:** Pseudoaneurysm, hand, radial artery, case report.

Pseudoaneurysms of the radial artery are rare and are most often localized in an area of penetrating vascular trauma or iatrogenic injury.<sup>1,2</sup> We report a very unusual case of bilateral radial artery pseudoaneurysms associated with complete absence of any ulnar contribution to the vascularity of the hand.

## Case Report

A 31-year-old right-handed healthy male corrections officer noted enlarging masses over the anatomic snuff box areas of his right and left hands. The

patient had a history of Raynaud's disease but was not a smoker and denied any personal or family history of collagen/vascular disease. Although he did practice martial arts, he recalled no significant history of trauma to his extremities. The masses had enlarged and became increasingly tender. His family physician obtained color flow arterial images of the wrist. This study documented a 0.6 cm × 0.5 cm aneurysm with mural thrombus with a resultant true lumen of 0.34 cm in a branch of the right radial artery at the base of the thumb. No abnormality was documented in the left wrist. The patient was then referred to a surgeon who recommended excising the masses. The patient sought a second opinion from a vascular surgeon; he was referred to our institution for management.

Physical examination revealed a firm, approximately 1.5-cm pulsatile mass at the ulnar base of the first carpometacarpal joint of the right hand. A smaller 1.0-cm mass existed in the same location on the left hand. The mass of the right hand was exquisitely tender, while the mass of the left hand was moderately tender to palpation. An Allen's test re-

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**Figure 1.** Arteriograms of the right (A) and left (B) forearms and hands demonstrating hypoplasia of proximal ulnar arteries and the lack of superficial palmar arches. The arrows indicate pseudoaneurysms.

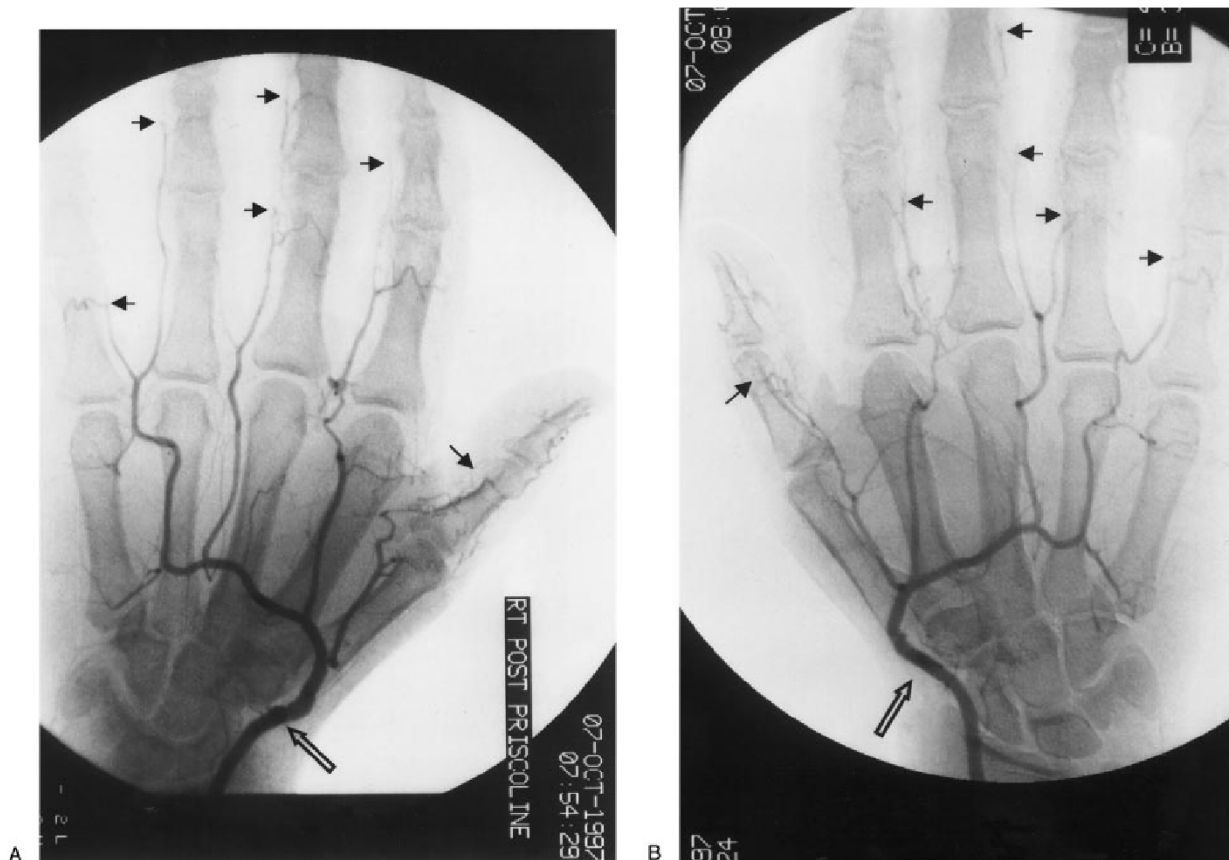
vealed complete radial arterial dominance bilaterally. Because the color flow images failed to define both masses, an arteriogram was obtained which demonstrated ulnar arteries that were hypoplastic at their origin from the brachial artery. These hypoplastic ulnar arteries were smaller than the adjacent interosseous arteries. These arteries then became completely atretic at the wrist. Antegrade filling of the deep palmar arches occurred only through the radial arteries without any contribution from the atretic ulnar arteries. No superficial palmar arches were seen bilaterally (Fig. 1). There were bilateral, symmetrical, distal digital occlusions with poor distal reconstitution, which is typical of advanced Raynaud's disease (Fig. 2). At the first carpometacarpal level, there was slight irregularity and ectasia of the radial artery as it entered the deep palmar arch (Fig. 3).

Because of increasing size, tenderness, and poten-

tial for vascular compromise, surgery was recommended. On exploration of the right hand, a pseudoaneurysm of the deep branch of the radial artery was found at its bifurcation (Fig. 4). The mass measured approximately 1.5 cm in length and 0.7 cm in diameter (Fig. 5). The pseudoaneurysm was resected. Due to the location of the radial artery pseudoaneurysm and the required length of arterial resection to produce pulsatile blood flow, reconstruction of the radial artery was facilitated by using a reverse cephalic vein interpositional graft. The patient had no intraoperative or postoperative complications and his pain was completely relieved. Special pathology staining techniques (Movat) documented a prominent area in which the elastic tissue and smooth muscle were absent and replaced by a rim of fibrotic tissue. The vascular lumen in this area contained hemorrhagic material (Fig. 6). These findings were consistent with pseudoaneurysm. Postoperative evaluations con-







**Figure 2.** Arteriograms of the right (A) and left (B) hands and wrists demonstrating ectasia of the radial arteries (large arrows) and bilateral, symmetrical, distal digital occlusions with poor distal reconstitution (small arrows), consistent with advanced Raynaud's disease.

firmed persistent pulsatile flow through the vein graft segment without any sign of vascular compromise.

One year later the patient reported that the right hand remained asymptomatic but that his left wrist was becoming somewhat more uncomfortable. He underwent a resection of the pseudoaneurysm and microsurgical reconstruction using primary anastomosis. Once again there were no complications and the pain was relieved. In fact, the patient reported that his hands also had less pain in cold weather. Pathology confirmed a pseudoaneurysm.

### Discussion

Aneurysms of the radial artery are uncommon and can be classified as either pseudoaneurysms or true aneurysms.<sup>1-3</sup> Aneurysms that result from a penetrating injury are pseudoaneurysms. These pseudoaneurysms do not contain all histologic layers of the vessel wall. They are sac-like projections of fibrous tissue in which a false lumen is in continuity with the

normal vessel. True aneurysms are usually due to direct or repetitive blows to the vessel. All layers of the arterial wall are involved, leading to fusiform swelling of the vessel several days to several months after the initial injury. Thrombus within the aneurysm can reduce or block flow through the vessel lumen.<sup>4,5</sup> An aneurysm of the radial artery is most often associated with blunt trauma to the superficial branch where it is relatively unprotected.<sup>6</sup>

Normally, the ulnar artery enters the hand deep to the volar carpal ligament. It terminates by dividing into a deep and superficial branch, each of which joins the corresponding branch of the radial artery to form the deep and superficial palmar arches. The radial artery enters the hand deep to the tendons of the first extensor compartment. The artery then pierces the first dorsal interosseous muscle and lies between this muscle and the adductor pollicis muscle. Branches of the radial artery include the superficial palmar, the princeps pollicis branch, the indicis





**Figure 3.** Magnified view. The arrow indicates radial artery pseudoaneurysm.

proprius branch, and the deep branch. The deep palmar arch is usually dependent on the deep branch of the radial artery.<sup>7</sup> In their classic paper, Coleman and Anson<sup>8</sup> found that approximately 80% of hands have complete superficial palmar arches and 97% have complete deep palmar arches. These investigators also described variations of the arterial patterns of the superficial palmar, deep palmar, and dorsal arches. The superficial arch was incomplete in approximately 20% of cases and received contributions from the radial, ulnar, and sometimes a persisting median artery. In their series of 650 cadaveric dissections, there was no case in which there was complete absence of ulnar artery contribution to the vascularity of the hand. There has been only a single case reported of bilateral hypoplastic ulnar arteries.<sup>9</sup>

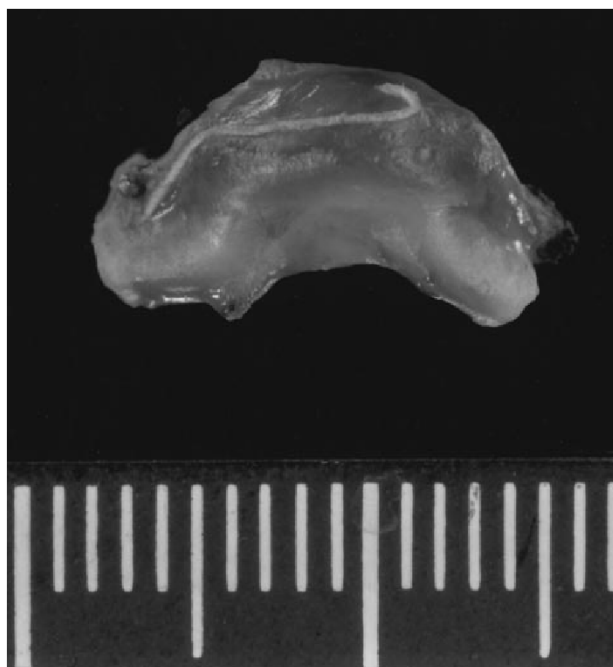
If indeed pseudoaneurysms of the deep branch of the radial artery are uncommon, it could be assumed that bilateral pseudoaneurysms would be even more unusual. Malt<sup>10</sup> reported a case of bilateral radial artery aneurysms with absent ulnar flow to the hand, but the etiology in this patient was due to arteriosclerotic aneurysms with concurrent thrombosis of both ulnar arteries. In Malt's case, however, the pathology was only documented for the right upper extremity because no angiography or surgery was performed on the left upper extremity. Bilateral an-



**Figure 4.** Operative view. The arrow indicates isolated pseudoaneurysm of the superficial branch of the radial artery.

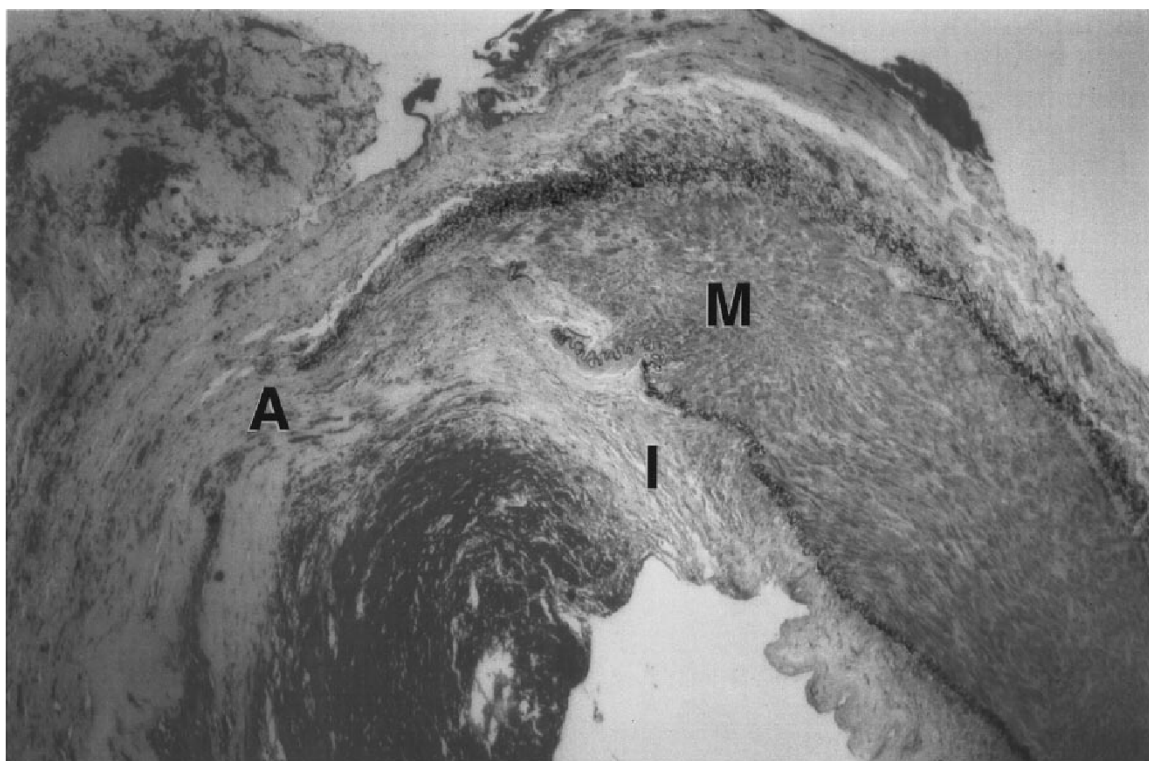






**Figure 5.** A resected pseudoaneurysm specimen.

eurysms of the superficial branch of the radial artery have been recently reported by Neill-Cage et al<sup>11</sup> to be associated with thenar hammer syndrome. Unfortunately, no pathology was presented to define whether the entities in this report were true aneurysms or pseudoaneurysms. In our case, there was clearly no penetrating trauma, which would customarily be associated with a pseudoaneurysm. The only potential injury in this patient would have been the result of blunt trauma to the hand and wrist, which typically results in a true aneurysm not a pseudoaneurysm. Therefore, the manifestation of bilateral, congenital, hypoplastic ulnar arteries, coupled with bilateral, seemingly atraumatic, pseudoaneurysms of the deep branch of the radial arteries in a single patient would be rare. In addition, this case was further complicated because the pseudoaneurysms occurred in a site from which the vascularity of the hands was completely dependent. Resection of the pseudoaneurysms without arterial reconstruction would have certainly compromised circulation to this patient's hands. This case illustrates the importance of a thorough history and physical examination when evaluating a mass of the hand. An Allen's test is an



**Figure 6.** Movat staining of the specimen. A, pseudoaneurysm; M, media; I, intima.





essential part of the physical examination when assessing the vascular supply to the hand.

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