Surgical Treatment of Aneurysms in the Upper Limbs

Kimihiro Igari, MD, Toshifumi Kudo, MD, PhD, Takahiro Toyofuku, MD, PhD, Masatoshi Jibiki, MD, PhD, and Yoshinori Inoue, MD, PhD

Objective: The purpose of this study was to review the experience of aneurysms in the upper limbs treated with surgery and assess the outcomes.

Materials and Methods: This study retrospectively reviewed the medical records of five patients with upper extremity aneurysms treated with surgical resection at Tokyo Medical and Dental University Hospital between March 2000 and February 2012. These patients were treated with excision surgery either with or without reconstructive surgery.

Results: Two of the five patients were males and three were females with a mean age of 52 years (age range: 25–72 years). We treated 2 brachial, 2 ulnar, and 1 radial aneurysms. All aneurysms were excised, and two patients had reconstructive surgery. Three patients had false aneurysms, which included an ulnar artery aneurysm diagnosed as angiolymphoid hyperplasia with eosinophilia. During follow-up period, all grafts were clinically patent, and no cases had recurrent lesions. No patients had ischemic symptoms or any other postoperative complications.

Conclusion: Arterial aneurysms of the upper extremities are uncommon, and were most commonly caused by non-traumatic etiology in this series. These aneurysms were excised with or without reconstructive surgery, because of the fear of rupture and embolization. Revascularization can be performed selectively.

Keywords: aneurysm, upper extremity, reconstruction, trauma

Upper extremity arterial aneurysms are uncommon lesions, and most are false aneurysms.1) However, they are important because of the potential to thromboem-bolize or rupture.2) True aneurysms of the brachial and more distal arteries are more rare.1) Early surgical intervention is recommended as the preferred management.3) Data on the incidence and distribution of aneurysms are important in their accurate prediction and effective management; however, such data have not yet been well established. This study reports the surgical management of upper extremity aneurysms, and evaluates the outcomes.

MATERIALS AND METHODS

All patients provided their informed consent for this study using the informed consent sheet preoperatively, and approval was obtained from our Institutional Review Board for a retrospective review of patients’ medical records and images. Five patients underwent surgical excision of aneurysms in the upper limbs with or without reconstruction surgery at Tokyo Medical and Dental University Hospital between March 2000 and February 2012. Patients with aneurysms due to iatrogenic arterial injury were excluded from this review. It was because that, nowadays, the most commonly identified cause of aneurysms of upper extremity arteries is iatrogenic.4) In the same period, between March 2000 and February 2012, we treated surgically seven patients with upper extremity aneurysms due to iatrogenic cause. The data were obtained
brachial aneurysms, two ulnar aneurysms and one radial aneurysm. Two brachial arterial aneurysms and two ulnar aneurysms were located in the forearms, and one radial artery aneurysm in the anatomical snuff-box. Three (60%) of the aneurysms had intramural thrombus. All patients had an asymptomatic mass. The cause of aneurysms was repetitive blunt trauma (recreational activity of Japanese fencing) in one patient and idiopathic factors in four patients. Two patients (40%) had a smoking history and two (40%) patients had hypertension. Furthermore, one patient had eosinophilia, and one patient had rheumatoid arthritis.

The decision to repair was based on several factors, such as perceived risk of rupture or thromboembolic complications, and surgical risk. All aneurysms were excised without the damage to the adjacent nerves, and two patients (40%) had reconstructive surgery with conduits. The decision to ligate or revascularization of the affected artery was based on only the distal perfusion. Revascularization was performed with two autogenous conduits. All ligated cases had good collaterals.

Five patients (2 males and 3 females) had confirmed upper extremity arterial aneurysms. We treated two brachial aneurysms, two ulnar aneurysms and one radial aneurysm. Two brachial arterial aneurysms and two ulnar aneurysms were located in the forearms, and one radial arterial aneurysm in the anatomical snuff-box. Three (60%) of the aneurysms had intramural thrombus. All patients had an asymptomatic mass. The cause of aneurysms was repetitive blunt trauma (recreational activity of Japanese fencing) in one patient and idiopathic factors in four patients. Two patients (40%) had a smoking history and two (40%) patients had hypertension. Furthermore, one patient had eosinophilia, and one patient had rheumatoid arthritis.

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TABLE 1  Patients characteristics

<table>
<thead>
<tr>
<th>Patient No.: Age, Gender</th>
<th>Location of aneurysm</th>
<th>Size of aneurysm (mm)</th>
<th>Presentation</th>
<th>Cause of aneurysm</th>
</tr>
</thead>
<tbody>
<tr>
<td>1: 25, F</td>
<td>Brachial</td>
<td>25</td>
<td>Asymptomatic mass</td>
<td>Trauma</td>
</tr>
<tr>
<td>2: 46, M</td>
<td>Brachial</td>
<td>30</td>
<td>Asymptomatic mass</td>
<td>Idiopathic</td>
</tr>
<tr>
<td>3: 53, F</td>
<td>Ulnar</td>
<td>26</td>
<td>Asymptomatic mass</td>
<td>Idiopathic</td>
</tr>
<tr>
<td>4: 66, M</td>
<td>Ulnar</td>
<td>40</td>
<td>Asymptomatic mass</td>
<td>Idiopathic</td>
</tr>
<tr>
<td>5: 72, F</td>
<td>Radial</td>
<td>15</td>
<td>Asymptomatic mass</td>
<td>Idiopathic</td>
</tr>
</tbody>
</table>

F: female; M: male

TABLE 2  Surgical procedures, pathological findings and follow-up periods

<table>
<thead>
<tr>
<th>Patient No.: Age, Gender</th>
<th>Procedure</th>
<th>Revascularization</th>
<th>True or False</th>
<th>Pathology</th>
<th>Follow-up (months)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1: 25, F</td>
<td>E and R</td>
<td>GSV, I</td>
<td>T</td>
<td>NS</td>
<td>27</td>
</tr>
<tr>
<td>2: 46, M</td>
<td>E and R</td>
<td>GSV, I</td>
<td>F</td>
<td>NS</td>
<td>12</td>
</tr>
<tr>
<td>3: 53, F</td>
<td>L and E</td>
<td>–</td>
<td>F</td>
<td>ALHE</td>
<td>23</td>
</tr>
<tr>
<td>4: 66, M</td>
<td>L and E</td>
<td>–</td>
<td>F</td>
<td>NS</td>
<td>20</td>
</tr>
<tr>
<td>5: 72, F</td>
<td>L and E</td>
<td>–</td>
<td>T</td>
<td>D</td>
<td>42</td>
</tr>
</tbody>
</table>

F: female; M: male; E and R: excision and revascularization; L and E: ligation and excision; GSV: great saphenous vein; I: interposition; T: true aneurysm; F: false aneurysm; NS: nothing significant change; ALHE: angiolymphoid hyperplasia with eosinophilia; D: degenerative

RESULTS (Tables 1 and 2)

Five patients (2 males and 3 females) had confirmed upper extremity arterial aneurysms. We treated two
Case No. 3
A 53-year-old female presented with a painless mass in her left forearm. On physical examination, she had a 3 × 3 cm mobile, pulsatile mass in the left forearm. The left radial and ulnar arteries were palpable, and the pulse status was normal in all the other extremities. She had a past medical history of uveitis that had been treated with steroids for 1 year and was successfully cured. The laboratory findings revealed mild eosinophilia (700/μl). Computed tomography showed a 3 cm diameter aneurysm of the left forearm (Fig. 2a). The patient was diagnosed with an ulnar artery aneurysm. To prevent distal emboli and rupture, the patient was taken to surgery. During the operation, the mass was totally resected, and the reconstruction using great saphenous vein conduit was performed (Fig. 1b). Postoperatively, she had no ischemic complications.
of the arterial wall. The tissue was infiltrated with numerous eosinophils (Fig. 2b), and we diagnosed this case as ALHE. The patient did well postoperatively, and the eosinophilia gradually resolved after the operation. After 3 months, the count of eosinophils had decreased to within the normal range.

**Discussion**

Aneurysms in the arteries of the upper extremities are rare, and most have been documented in case reports. The most common identified cause of aneurysms of the upper extremity arteries is trauma. Chronic repetitive blunt trauma, such as the use of crutch or using the hand to hit objects, can cause axillary artery aneurysms or ulnar aneurysms, respectively. The mechanism of aneurysmal formation is thought to be that, compression of the arterial wall produces a contusion of the arterial media with subsequent weakness of the wall and fusiform dilatation. True aneurysms are caused by degenerative, congenital, metabolic disorders, compression due to thoracic outlet syndrome. This can be associated with diseases such as, Kawasaki’s syndrome, Behcet’s disease, Buerger’s disease, Kaposi’s sarcoma, and cystic adventitial disease. Two of the patients in the current series had a true aneurysm, including one repetitive traumatic cause. The most common identified cause of false aneurysms of the upper extremity arteries is also trauma, especially the iatrogenic etiology. This study excluded the aneurysms with an iatrogenic cause, and three false aneurysms were observed. One false aneurysm was due to ALHE. ALHE is an unusual vascular proliferation with stromal inflammation occurring predominantly in the dermis and subcutaneous tissue of the head and neck, whose appearance is usually one of bright red papules or nodules. ALHE distinguishes itself from other hemangiomas by its histologically unique appearance. The most typical findings are a histiocyte-like endothelium with cuboidal to dome-shaped endothelial cells lining a florid vascular proliferation. Additionally, there may be heavy inflammatory infiltration of lymphocytes and eosinophils. Occasionally, ALHE leads to peripheral blood eosinophilia. In our ALHE case, the patient revealed with the eosinophilia preoperatively; however, interestingly, the eosinophilia resolved after the resection of ulnar artery pseudoaneurysm. Furthermore, ALHE affecting large muscular arteries is extremely rare, and a review of the literature revealed only a few reports of ALHE affecting arteries in the extremities.

The other two aneurysms were of unknown origin, in patients with no history of trauma.

The size of aneurysms does not seem to relate to symptoms. In the lower extremity aneurysms, there was no significant difference in size comparing asymptomatic with symptomatic aneurysms or those which had thrombosed or not thrombosed. For these reasons, the treatment indications of brachial, radial and ulnar artery aneurysms should not be determined based on the size and the presence of symptoms. The development of thromboembolic complications with subsequent finger and hand ischemia can occur without any warning signs. The surgical procedures for the aneurysms in the upper limbs depend on the presence of adequate perfusion in the hand after the aneurysm is excluded from the hand circulation. Simple resection is the surgical option if the hand is adequately perfused. If the patients with inadequate hand perfusion can undergo arterial reconstruction by primary end-to-end anastomosis, there is no tension or with the use of an interposition vein graft if the defect is large. Some authors have proposed revascularization whenever possible, whereas others have argued for selective revascularization. The two ulnar artery aneurysms and one radial artery aneurysm in the current series were resected without reconstruction, because the patients had a normal preoperative Allen test, and surgical evidence of adequate hand perfusion after excluding the aneurysms from the hand circulation. Endovascular treatment including embolic therapy might be an option. A less invasive endovascular treatment using stent grafts has been reported as an alternative to open repair; however, few studies and few cases of upper extremity aneurysms treated with endovascular procedures reported the outcome after long-term follow-up. Furthermore, we could not use the commercialized stents or stent grafts for upper extremity aneurysms in Japan. We performed open surgeries for our cases, and achieved good results.

**Conclusion**

Upper extremity arterial aneurysms are uncommon, and were most commonly caused by idiopathic etiology in the current study. All patients were treated with excisional surgery to prevent adverse events, such as rupture and embolization. All grafts were clinically patent, and no patients had ischemic symptoms or other postoperative complications. We safely treated the aneurysms with surgical resection, and achieved good results.
DISCLOSURE STATEMENT

Igari and the other co-authors have no conflicts of interest to declare.

REFERENCES