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Aneurysm

Surgical treatment of giant fusiform aneurysm of extracranial internal carotid artery in a child: 1 case report and literature review

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Abstract

Background: The objective of this study is to report diagnosis and treatment results of giant fusiform aneurysm of extracranial internal carotid artery in a child and review the relative reference to enhance the knowledge of it.

Methods: A 13-year-old female patient was admitted to the hospital with chief complaint of pulsatile mass in her left cervical area for 1 year, which had abruptly augmented 2 months earlier. No cervical trauma or infection appeared. A 3.5 × 6–cm mass in the left cervical angle of the mandible was observed to beat with pulse without vascular murmur. Digital subtraction angiography and CTA showed a giant fusiform aneurysm 6 cm in length and 3 cm in maximum diameter from the beginning of the left internal carotid artery. After resection of the aneurysm, vascular continuity was restored by interposition of a 6-mm PTFE graft.

Results: Pathologic examinations showed hyperplasia in artery wall, fibroplasias and mucous degeneration, hyalinization, chronic inflammatory cell infiltration, and local calcification. The recovery was good without complication. The patient was followed up in 2 years postoperation. The CTA and color Doppler ultrasonography showed good configuration and distribution of the internal carotid artery and good circulation in vascular cavity.

Conclusions: Giant fusiform aneurysm of extracranial internal carotid artery in children is rather rare. The main causes are atherosclerosis, infection and trauma, incurring by carotid endarterectomy, and the like. Most of the clinical manifestations are pulsatile nontender mass. It can cause severe complications, such as brain ischemia or cervical hematorrhea incurred by rupture of aneurysm. The therapy includes resection of the aneurysm and restoration of flow with venous, arterial, or prosthetic graft or endovascular stenting.

Keywords: Extracranial internal carotid artery; Aneurysm; Surgical treatment

1. Introduction

Extracranial internal carotid artery aneurysm is rare. One case of a giant fusiform aneurysm of extracranial internal carotid in a child was reported in our hospital. After the resection of the aneurysm and interposition of the PTFE graft, the child was followed up for 2 years with good result. The pathogenesis, clinical manifestation, diagnosis, and treatment of aneurysm in extracranial internal carotid artery were discussed by reporting this case and reviewing the relative references.

2. Case report

A 13-year-old girl was admitted because of a pulsatile mass in the left part of her neck for 1 year, which had abruptly augmented 2 months earlier. She is of Han descent

Abbreviations: CTA, computerized tomographic angiography; DSA, digital subtraction angiography; PTFE, Polytetrafluoroethylene.

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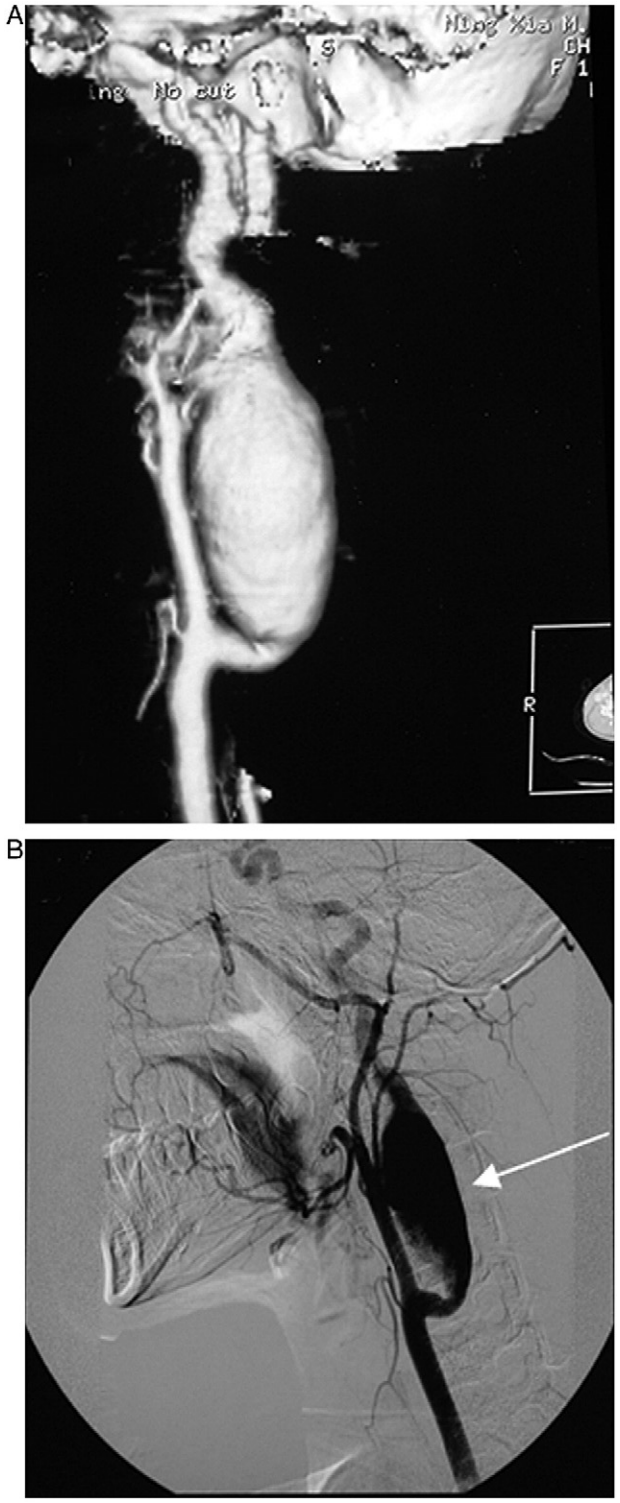

Fig. 1. A: Computed tomographic angiography. B: DSA showed giant fusiform aneurysm in the left internal artery carotid artery (6 cm in length and 3 cm in maximum diameter) (arrow).

and comes from Honghua County, Yinchuan City, Ningxia Province. The pulsatile mass was found intentionally in the left cervical part 1 year before she was admitted to the hospital, but no treatment was done because it was painless. Two months before she was admitted to the hospital, the mass augmented abruptly without symptoms of headache, dizziness, or fainting. No cervical trauma, infection, or family history were presented. On hospital admission, the patient presented with the following conditions: temperature, 36.8°C; pulse, 90/min; respiration, 18/min; blood pressure, 110/70 mm Hg; normal development; and medium nutrition. A 3.5 × 6–cm mass was touched in the left cervical angle of the mandible and beat with pulse

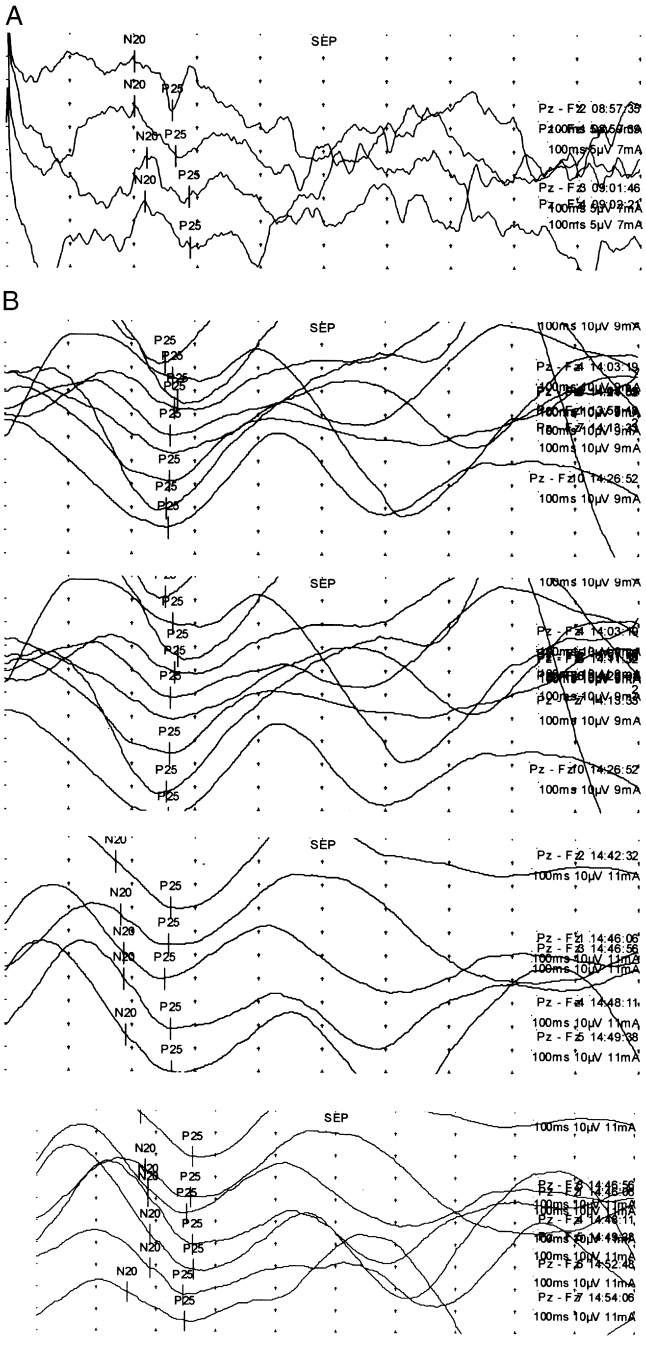

Fig. 2. Evoked cortical potential monitoring preoperative (A), intraoperative (B), high-amplitude waves seen on spontaneous electromyography of cricothyroid muscles dominated by the vagus nerve, intraoperative (C).

C

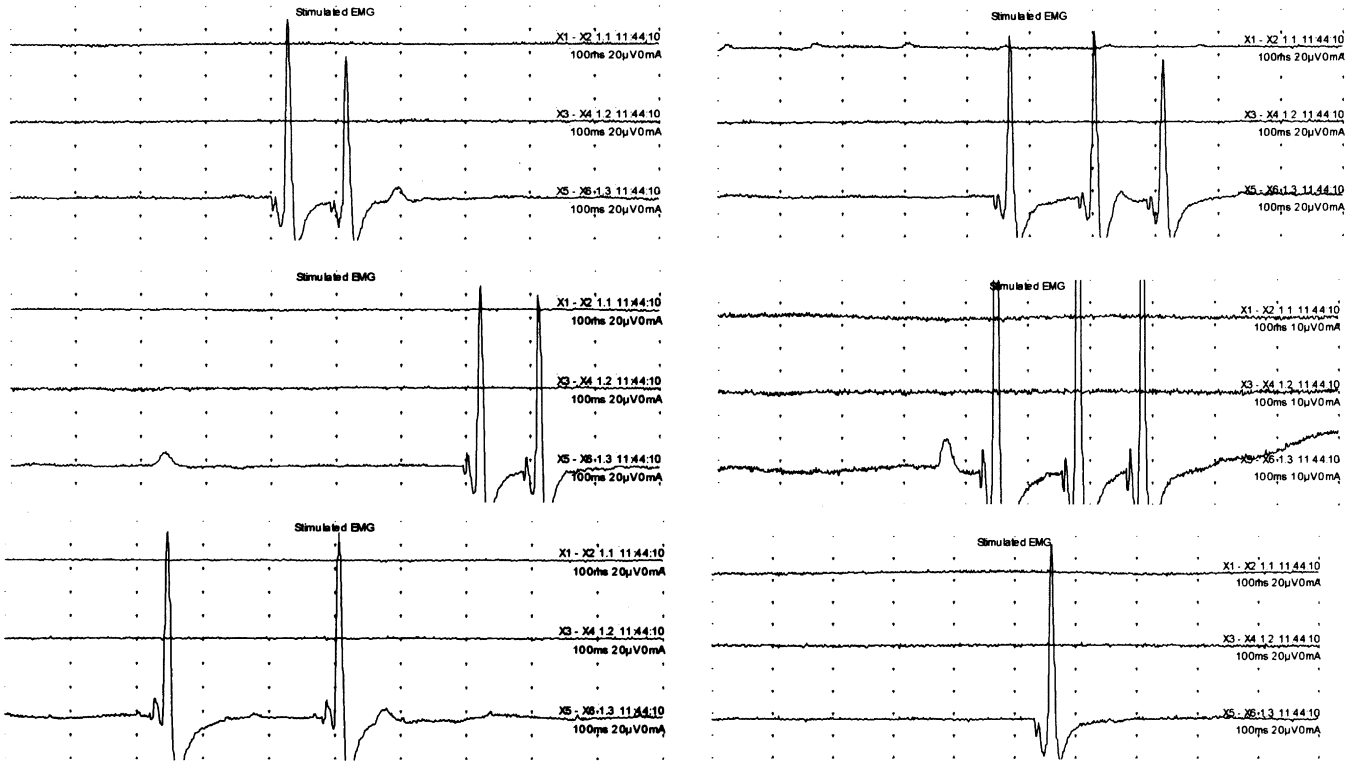

Fig. 2. (*continued*)

without vascular murmur. None was found in the neurologic inspection. The laboratory inspection results were normal in blood routine, negative in syphilis serologic identification, and negative in bacteriologic examination. No abnormality was found in the cervical plain film. All the cardiological, cardiosurgical, and ophthalmologic examinations helped to exclude the possibility of the Marfan syndrome and progeria. Computed tomography angiography and DSA showed a giant fusiform aneurysm in the left internal carotid artery ranging from 1.5 cm to carotid bifurcation to skull base (Fig. 1A, B). The distribution of the cranial arteries and the blood supply was normal.

3. Results

To avoid the ischemia incurred by the failure in reconstructing the left internal carotid artery, we performed a Matas' test. After compressing on the left common carotid artery for 50 to 60 minutes could be endured, DSA was undertaken. When the left common carotid artery was blocked by a balloon, the left anterior cerebral artery restored the blood supply by the right internal carotid artery instantly (1 second), and the left middle cerebral artery restored the blood supply by right vertebral artery instantly (2 seconds), which indicated that even if the left internal carotid artery were ligated, no ischemia would present. When the previously mentioned preparation was finished, resection of the left internal carotid artery aneurysm and artery reconstruction was undergone under general anesthesia. During the operation, the upper limb nervus medianus–evoked cortical potential was monitored (Fig. 2). We commenced with a T-shaped incision in the left cervical area, transected the mandibular margo inferior, then extended it to the margo medialis of sternocleidomastoideus to completely expose and isolate the cervical vein, common carotid artery, external carotid artery, internal carotid artery, and aneurysm, with careful protection of the vagus nerve. A fusiform aneurysm, about 6 cm in length and 3 cm in diameter, stemmed from 1.5 cm to the carotid bifurcation with the distal part 1 cm away from the foramen lacerum of the skull base (Fig. 3A, B). After general heparinization, the proximal and distal aneurysms were clipped and the aneurysm was resected. A thin-walled PTFE graft (diameter, 6 mm) was interposed and anastomosed with internal carotid artery end-to-end via 6-0 polypropylene (Fig. 4). Then the heparinization was terminated with venous injection of protamine. The internal carotid artery was clipped for 45 minutes. When there was no oozing blood and the blood flow of the internal carotid artery was restored, the incision was sutured carefully. Pathologic examinations showed arteriasis, arteriofibrosis and mucous degeneration, hyalinization, chronic inflammatory cell infiltration, and local calcification (Fig. 5). After operation, the patient applied the warfarin for half a year (2.5 mg/d IP) and got good recovery

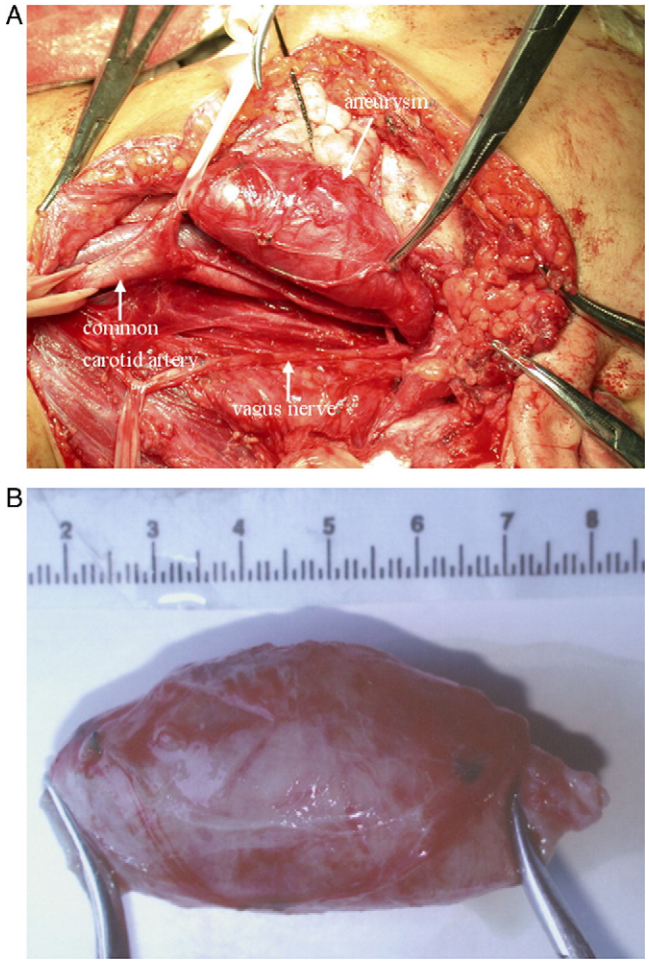

Fig. 3. A: The giant aneurysm stemmed from 1.5 cm to the carotid bifurcation with the distal part 1 cm away from foramen lacerum of the skull base. B: The aneurysm was resected.

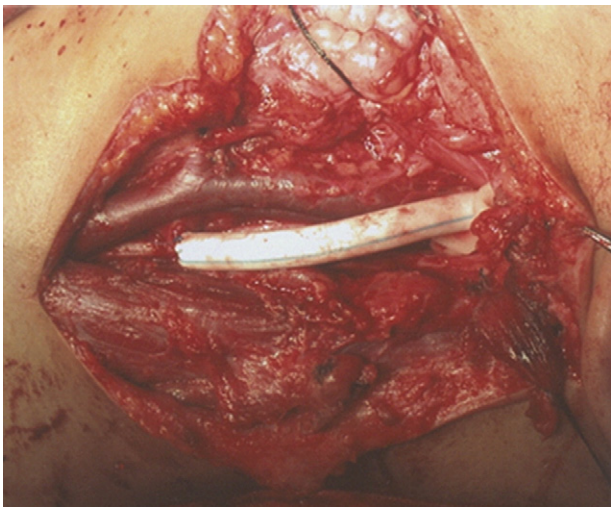

Fig. 4. After aneurysm was resected, a 6-mm polytetrafluroethylene graft was interposed to restore the vascular continuity.

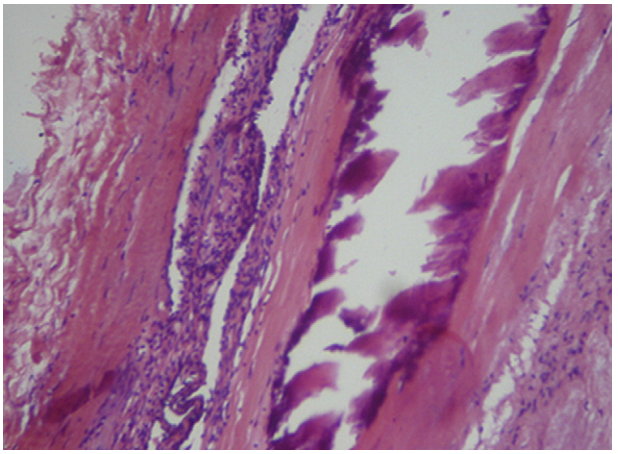

Fig. 5. Pathologic examination showed arteriasis, arteriofibrosis, mucous degeneration, hyalinization, chronic inflammatory cell infiltration, and local calcification (HE, ×100).

without complication. With a 2-year follow-up, the CTA demonstrated the disappearance of aneurysm and vascular continuity in the internal carotid artery (Fig. 6). Transcranial Doppler revealed good distribution and smooth inner wall of internal carotid artery with vascular

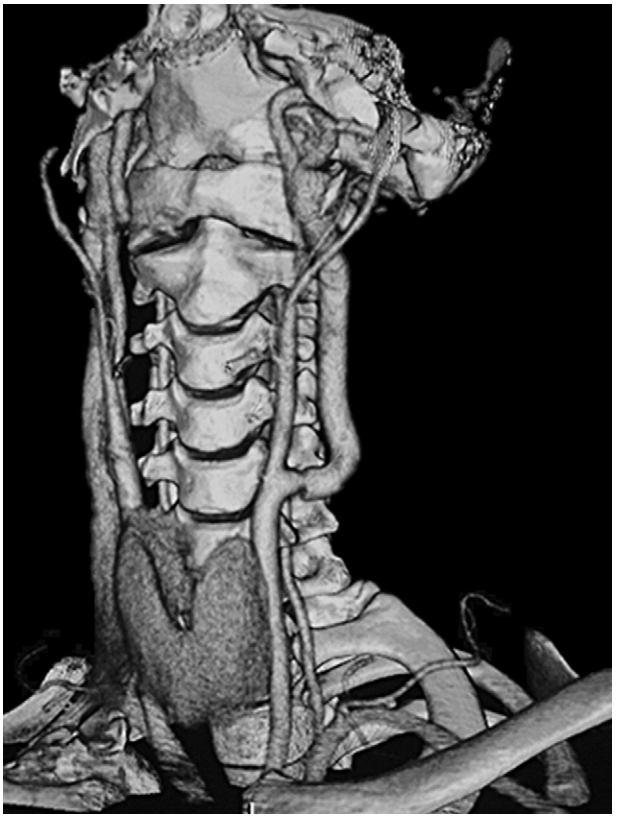

Fig. 6. Computed tomographic angiography 2 years postoperation showed the disappearance of aneurysm and vascular continuity in the left internal carotid artery.

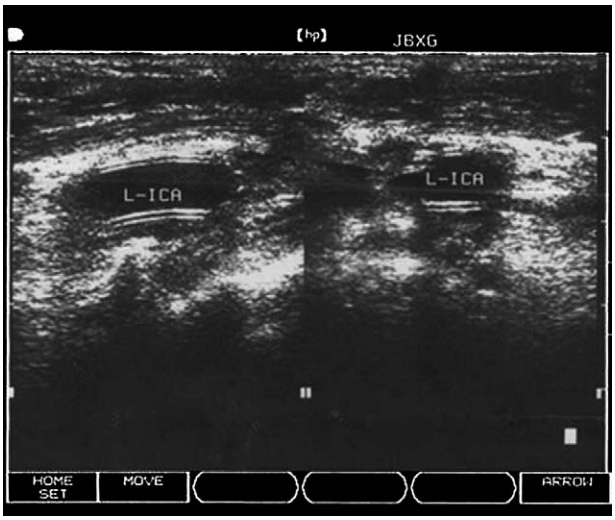

Fig. 7. Transcranial Doppler (2 years postoperation) revealed smooth inner wall of internal carotid artery with vascular continuity and normal velocity of blood flow.

continuity and normal velocity of blood flow (Fig. 7). The patient's ability to study was restored.

4. Discussion

Extracranial internal carotid artery aneurysm is very rare, especially in children. Up until now, only a few cases had been reported. El-Sabrout and Cooley [4] reported 29 cases of extracranial carotid artery through aneurysm admitted by the Texas Heart Institute, Houston, TX, in the last 35 years; Aleksic et al [1] reported 14 cases, with a mean age of 60 years, ranging from 4 to 82 years, admitted by the Vascular Surgery of Köln University, Cologne, Germany, from 1987 until 2003. There are only a few reports in China, less than 10 cases. It is generally regarded that the extracranial internal carotid artery aneurysms represent 0.2% to 0.4% of operated-on aneurysms and 0.1% to 1.9% of carotid operations. The ratio between male and female was 2:1 [9]. Cases of bilateral aneurysm or unilateral multianeurysm in rosary form were reported incidentally [2,5].

The common causes of extracranial internal carotid artery aneurysms are atherosclerosis, infection, trauma or postinternal carotid artery surgery (carotid endartrectomy), and the like. Infection had once been the most common one, but it became rare with the wide application of antibiotics, including 45% incurred by general infection (such as septicemia), 30% incurred by posttrauma infection (arteriopuncture or artery penetration), and 25% incurred by local infection (cervical lymphadenitis, peridental abscess, etc) [6]. Extracranial internal carotid artery aneurysm mostly began with painless cervical pulsatile mass without any other symptoms in the early stage. There was the risk of rupture, unilateral temporary ischemia, or cerebral infarction if no treatment was taken. Some authors reported that 50% to 100% of the patients presented symptoms in the advanced stage [2]. Our case only presented cervical mass without neurologic symptoms. Fourteen cases were reported by Aleksic et al [1], 10 cases presented painless cervical pulsatile mass, 3 cases were found incidentally by angiography with suspicion of other diseases, and 1 case was confirmed as aneurysm in the emergency operation because of cervical acute hemorrhage. In addition, according to some authors' reports, the aneurysm incurred by the cervical deep infection presented the Horner syndrome and cranial nerves IX, X, and XII paralysis [10].

5. Conclusions

Giant fusiform aneurysm of extracranial internal carotid artery in children is rather rare. The main causes are atherosclerosis, infection and trauma, incurring by carotid endarterectomy, and the like. Most of the clinical manifestations are pulsatile nontender mass. It can cause severe complications, such as brain ischemia or cervical hematorrhea incurred by rupture of aneurysm. The therapy includes resection of the aneurysm and restoration of flow with venous, arterial, or prosthetic graft or endovascular stenting.

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