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Covered Stent-Graft Treatment of a Postoperative Common Carotid Artery Pseudoaneurysm

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Summary

Background:

Extracranial carotid artery pseudoaneurysms are rare cases resulting from trauma, mycotic infection, head and neck carcinomas or complications related to their treatment. Trauma is the most common cause of carotid artery pseudoaneurysms. They can also present after surgery, most commonly following endarterectomy, which is a rare cause with an estimated incidence of 0.3–0.6%.

Case Report:

A 26-year-old male patient was admitted with swelling in his left neck after left carotid endarterectomy. Angiography confirmed pseudoaneurysm in the left carotid bulb and it was treated successfully with two heparin-bonded covered stent grafts.

Conclusions:

Endovascular treatment of carotid pseudoaneurysms with covered stent-grafts is a safe and efficient method providing definitive arterial reconstruction. But series with longer follow-up periods are needed to evaluate patient compatibility to lifelong antiplatelet therapy.

MeSH Keywords:

Carotid Artery Injuries • Drug-Eluting Stents • Endovascular Procedures

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Background

Extracranial carotid artery pseudoaneurysms are rare cases resulting from trauma, mycotic infection, head and neck carcinomas or complications related to their treatment [1]. Trauma is the most common cause of carotid artery pseudoaneurysms. They can also present after surgery, most commonly following endarterectomy, which is a rare cause with an estimated incidence of 0.3–0.6% [2,3].

Pseudoaneurysm is a sac formation communicating with arterial lumen which is confined by surrounding tissues [2]. This condition requires definitive treatment to prevent such complications as enlargement, pseudoaneurysm thrombosis, embolization from the thrombotic material within the pseudoaneurysm, hemorrhage after rupture or compression on the adjacent structures [1,3].

Traditionally most of these lesions were treated surgically if location and surgical exposure was favorable. Recent

advances in endovascular therapies, including covered stent-grafts, have provided safe and efficient treatment options for carotid artery pseudoaneurysms without the risk of blood loss or anesthesia-related complications during vessel patency restoration [1,4].

We present a rare case of a pseudoaneurysm of carotid artery which appeared following carotid surgery, and its endovascular treatment with covered stent-grafts.

Case Report

A 26-year-old male patient was admitted to otorhinolaryngology outpatient clinic with swelling on the left side of the neck which was recently subjected to a procedure. The patient was a construction worker with a history of heavy lifting using neck and shoulders. Neck ultrasonography (US) revealed a pseudoaneurysm of the left servical internal carotid artery (ICA) which was also confirmed by color Doppler ultrasonography (CDUS). The patient

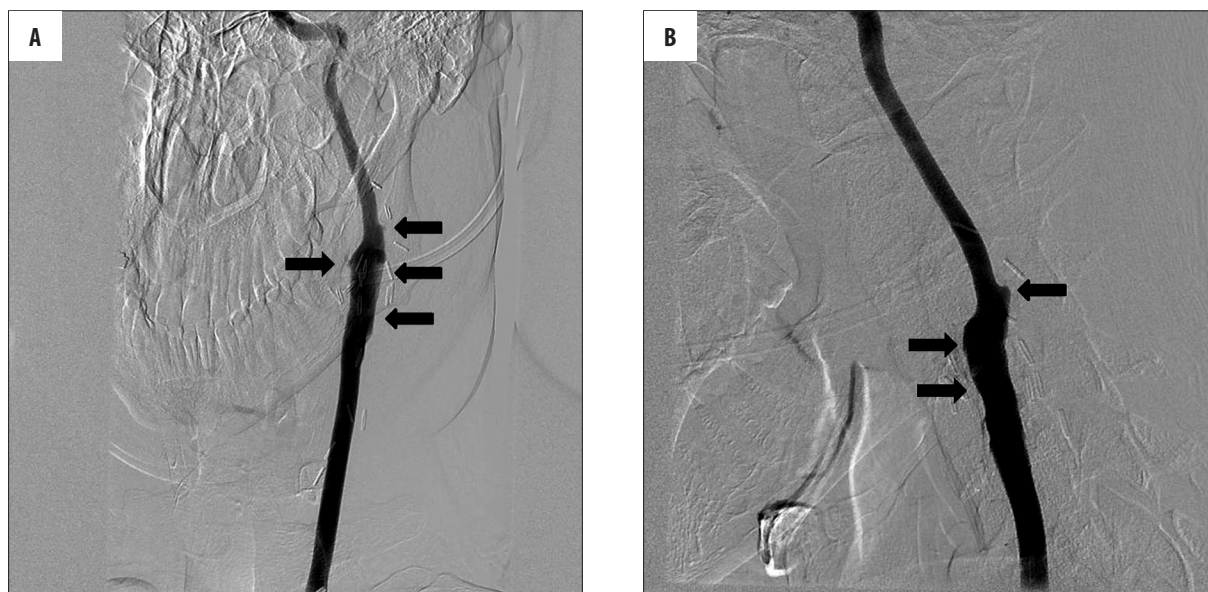


Figure 1. Left CCA injection revealed irregular filling of the pseudoaneurysm sac originating from CCA and extending to ICA (black arrows); anteroposterior projection (A), lateral projection (B).



Figure 2. Pseudoaneurysm sac filling was still present (black arrows) after deployment of the first covered stent-graft (white arrows); early arterial phase (A), late arterial phase (B).

was referred to cardiovascular surgery clinic and underwent surgical pseudoaneurysm repair. Post-operatively neck swelling did not regress and control CDUS showed a pseudoaneurysm originating from the left common carotid artery (CCA) extending to the ICA, approximately 3.5×2.5 cm in size. Subsequently, the patient was referred to our interventional radiology unit for diagnostic angiography and endovascular treatment. The left CCA was selectively catheterized and angiograms confirmed the pseudoaneurysm (Figure 1A, 1B). Next, a self-expandable stent graft (6×50 mm; Gore Viabahn Endoprosthesis®, W.L. Gore, Flagstaff, AZ, USA) was deployed in that segment, extending from CCA to ICA. But because of persistent filling in the pseudoaneurysm sac in control angiograms (Figure 2A, 2B), a second self-expandable stent graft

(7×50 mm; Gore Viabahn Endoprosthesis®, W.L. Gore, Flagstaff, AZ, USA) was deployed proximally, overlapping the first stent-graft from the proximal end. Control angiograms revealed minimal extravasation from both the upper and the lower end of the stented segment. Stent-grafts were expanded with a balloon catheter for optimal coverage. Control angiogram presented no signs of pseudoaneurysm filling, while both stent-grafts were patent (Figure 3A, 3B). A total number of 5000 units of heparin were administered during the procedure to prevent thromboembolic complications. The patient was discharged from hospital the following day and given once a day 75 mg of clopidogrel for 3 months and once a day 100 mg of acetylsalicylic acid for the rest of his life to ensure stent patency. In the 1st and 6th month, a follow-up CDUS examination



Figure 3. Radiogram of the neck demonstrated both covered stent-grafts (A). Control angiogram presented no signs of pseudoaneurysm filling while both stent-grafts were patent (B).

showed that both stents were patent. Moreover, patient's complaints regarding pseudoaneurysm disappeared completely in the follow up at 6 months.

Discussion

Pseudoaneurysms can be spontaneously thrombosed but it is unlikely in the carotid artery system due to a relatively high arterial flow as compared to the anatomical regions previously reported on [5]. Traditionally, pseudoaneurysms were treated surgically. However, surgical management of pseudoaneurysms can be challenging, especially if there is a difficulty with surgical exposure [4]. At the same time, surgical management of carotid artery pseudoaneurysms is associated with higher rates of morbidity and mortality compared to endovascular therapeutic options [6]. Also in our case, the recurrent pseudoaneurysm of the carotid artery presented as a post-operative complication of carotid pseudoaneurysm repair surgery.

Endovascular treatment options for carotid pseudoaneurysms include bare stent implantations with or without coil embolization, coil embolization alone or, more recently, covered stent grafts [7]. In the literature there are several reports on bare stent implantation with not too successful outcomes. In those reports, some of the pseudoaneurysms treated with bare stents failed to disappear due to a porous stent structure [1]. Adding coil embolization to bare stent placement was shown to be useful in some series [1]. However, there are opposite reports showing that ICA pseudoaneurysms may continue to opacify and enlarge after the procedure and suggesting that there is always a potential for pseudoaneurysm recanalization with bare stent implantation, even if it was combined with coil embolization [1]. Sibtain et al. reported on a case of bilateral traumatic carotid artery pseudoaneurysms which were first treated by using coil embolization instead of covered stent grafts because of contraindicated antiplatelet therapy at presentation [8]. But because of the recurrence

of ICA pseudoaneurysm 3 months after coil embolization, definite treatment with Wallgraft endoprosthesis was introduced.

Since 1980s, stent-grafts have become the preferable treatment method for vascular pathologies, particularly in supraaortic vessels [7]. There are several reports in literature indicating that pseudoaneurysms can be treated effectively and immediately with covered stent-grafts which allow for definitive reconstruction of the arterial wall [9]. Simionato et al. presented a case of traumatic CCA pseudoaneurysm which was treated with 2 stent-grafts [7]. The patient presented with syncopal episodes and a history of a motor vehicle accident 3 years earlier. The authors reported that during the 12-month follow-up, the patient remained asymptomatic with patent stent-grafts. Kubaska et al. presented 4 cases of ICA pseudoaneurysm of various etiologies including: stab wound, gunshot wound, ruptured carotid dissection and post-endarterectomy in a patient with a history of radical neck dissection and radiation therapy for squamous cell carcinoma [4]. The patients were treated with Wallgraft endoprosthesis. As there were no adverse neurological events or stenosis of the treated vessel, the authors concluded that the use of covered stent-grafts in ICA pseudoaneurysms is favorable regarding intermediate-term results. Therefore, covered stent-graft reconstruction of the carotid artery was our first choice of treatment. Regarding patient's young age, non-atherosclerotic wall and no significant pseudoaneurysm thrombosis, we preferred not to use any distal embolic protection devices.

On the other hand, covered stent-graft implantation has various complications including: distal embolism, acute stent thrombosis and rupture of the target vessel during deployment of the stent, septic embolism and endoleak/recurrent filling in the pseudoaneurysm sac [10,11]. Yi et al. retrospectively reviewed 10 patients with carotid or vertebral artery pseudoaneurysms treated with

covered stent-grafts [1]. The authors reported that pseudoaneurysm occlusion was achieved in all 10 patients during a follow-up period of 5 days to 25 months. One patient had a distal embolic complication of the middle cerebral artery despite anticoagulation and anti-platelet therapy which was attributed to dislodging of the occult thrombus within the pseudoaneurysm.

In our case, filling of the pseudoaneurysm sac was still present after deployment of the first covered stent-graft. That situation required a second stent-graft placement combined with balloon angioplasty for complete exclusion of the pseudoaneurysm.

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Intimal hyperplasia leading to stent stenosis or occlusion and stent thrombosis due to inadequate or inappropriate antiplatelet therapy were reported as late complications [11]. However, long-term patency rate of 93.2% was reported with stent-grafts in extracranial carotid artery aneurysms in literature review, which is a favorable result [12].

Conclusions

Endovascular treatment of carotid pseudoaneurysms with covered stent-grafts is a safe and efficient method providing definitive arterial reconstruction. However, series with longer follow-up periods are required to evaluate patient's compatibility to lifelong antiplatelet therapy.