DOI: https://doi.org/10.2298/SARH180125031J
UDC: 616.133-089.168:616-002; 616.133-089.843

CASE REPORT / ПРИКАЗ БОЛЕСНИКА

The use of a vascular patch CorMatrix ECM® for reconstruction of carotid arteries in the treatment of postoperative wound infection.

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SUMMARY
Introduction Operation site infection after carotid endarterectomy is a rare, but potentially fatal complication.
The aim of this paper was to present two cases of using CorMatrix ECM® patch for reconstruction of a damaged artery in the course of an operation site infection.
Outline of cases There was an infection and pseudoaneurysm formation in these patients after carotid endarterectomy; one of them ruptured, causing massive hemorrhage.
In both cases, carotid artery was reconstructed using CorMatrix ECM® patch resulting in resolution of infection and postoperative wounds healing with maintained complete patency of carotid arteries.
Conclusion The vascular patch of the extracellular matrix CorMatrix ECM® enables successful and safe angioplasty of an artery.
Keywords: operation site infection; carotid endarterectomy; artery reconstruction

INTRODUCTION

Postoperative wound infection in patients who underwent carotid endarterectomy is a rare but severe and potentially fatal complication. In this group of patients, the risk of infectious complications is higher after carotid endarterectomy with prosthetic patch closure (ePTFE, polyester). There is a need for effective methods of management and treatment of infectious complications of vascular surgery procedures. A vascular patch of biological material, CorMatrix ECM®, was used to close the carotid artery in the infected operation site.

REPORT OF CASES

First case

A 67-year-old patient with a history of bilateral carotid endarterectomy, ischemic heart disease, hypertension and type 2 diabetes mellitus, was admitted to the Department of Vascular Surgery due to exacerbation of chronic ischemia of the right lower extremity with accompanying resting pain, without trophic changes in the extremity. Thrombectomy of the right popliteal artery was performed, achieving marked improvement of blood supply. Four months earlier the patient had undergone right carotid endarterectomy. Upon admission to the Department, purulent discharge from the lower pole of the postoperative neck wound on the right side was noted (Figure 1).

Figure 1. Purulent fistula in the lower pole of the postoperative wound

The history indicated that impaired wound healing and recurrent mild fever persisted for the past three months. Since he was admitted to the Department, the patient was not consulted by a surgeon about this issue; he did not attend a scheduled follow-up visit after restoration of patency of carotid arteries. Angio-computed tomography of the brain supplying arteries was performed that revealed bilaterally normal patency of the operated carotid arteries and a deep cutaneous fistula, reaching the bifurcation of the right common carotid artery, destruction of adjacent soft tissues and signs of pseudoaneurysm. Methicillin-susceptible *Staphylococcus aureus* (MSSA) was cultured from the wound material. Initial treatment, targeted antibiotic therapy, like cloxacillin, was started as well as a dressing treatment, resulting in gradual improvement of general and local condition. Due to the bloody stain of the wound discharge, the patient was qualified to an expedited surgical treatment. The procedure was performed under general

Received • Примљено: January 25, 2018
Accepted • Прихваћено: March 28, 2018
Online first: April 13, 2018

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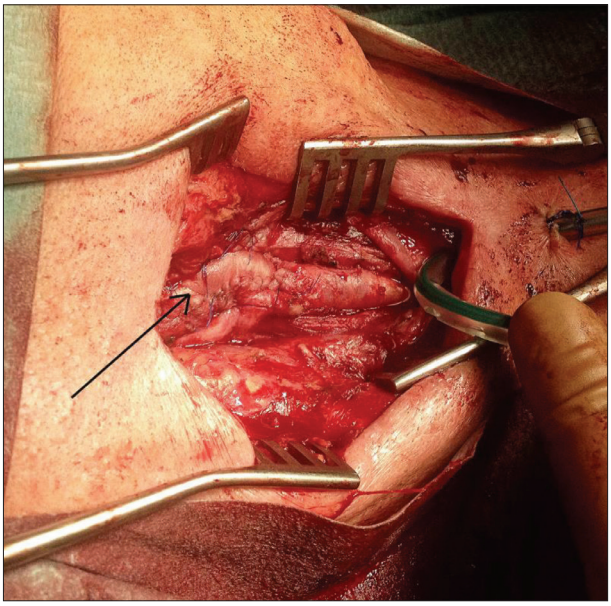

Figure 2. Status following angioplasty of the bifurcation of the right common carotid artery using the CorMatrix patch (intraoperative view)

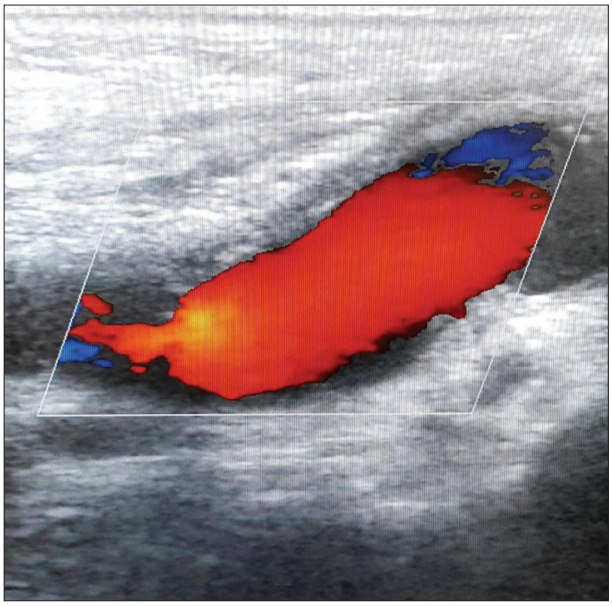

Figure 3. A follow-up US imaging six months after the repeated operation; complete remodeling of the CorMatrix patch with preserved complete patency of the artery at the site of its implantation

anesthesia. Intraoperatively advanced purulent changes of soft tissues and leaking vascular patch were found. The procedure was performed using a temporary shunt. The infected vascular patch was completely excised, the external carotid artery was underpinned and arterial margins were refreshed. The defect in the arterial wall was managed with a vascular patch CorMatrix ECM® (Figure 2).

The perioperative and postoperative periods were uneventful, without acute neurological deficits. In the postoperative period targeted antibiotic therapy was maintained, normal postoperative wound healing was observed over the subsequent days, inflammatory parameters were normalized and the fever subsided. The patient was discharged from the hospital in good general and local condition, without neurological deficits, and continuation of targeted antibiotic therapy was recommended.

Second case

A 62-year-old patient with hypertension and type 2 diabetes mellitus was admitted to the Department in an emergency setting due to hemorrhage from the postoperative wound only fifteen days after the carotid endarterectomy with primary suture on the left side. The patient reported a mass at the site of the postoperative wound that had engorged over the past few days, as well as increasing difficulties with respiration and swallowing. On admission she did not demonstrate any acute neurological deficits. The patient underwent an emergency surgical treatment, where intraoperatively massive purulent wound changes were found with a ruptured pseudoaneurysm at the site of dehiscence of the carotid arteriotomy. Secondary suture was placed, resulting in satisfactory hemostasis and complete patency of operated arteries. After the procedure, the patient was in good general condition, without any neurological deficits. On day one after the procedure, there was an incidence of left cerebral hemisphere ischemia symptoms, in other words, right partial hemiparesis. US Doppler imaging revealed thrombosis of the left internal carotid artery. The patient's operation was repeated in an emergency setting. Thrombectomy of the left carotid arteries was performed, resulting in pulsating inflow and satisfactory retrograde outflow. After implantation of a temporary shunt, angioplasty was performed with a vascular patch CorMatrix ECM®. Further treatment included empiric antibiotic therapy and subsequently targeted antibiotic therapy according to results of the culture. We managed to achieve complete healing of the postoperative wound with complete patency of carotid arteries. After the surgery, gradual resolution of neurological deficits was observed, and the patient was discharged from the hospital in good general and local condition.

During the six-month follow-up, nn both cases, no infection recurrence was found. US Doppler imaging of brain supplying arteries revealed complete restoration of walls of carotid arteries on the CorMatrix® matrix without any evidence of restenosis (Figures 3 and 4).

DISCUSSION

International scientific societies' guidelines currently recommend endarterectomy of the internal carotid artery using a vascular patch due to lower risk of restenosis and early occlusion than with primary suture [1]. The risk of infection of the operation site in this group of patients is 0.5–1% [2, 3]. The most common infectious pathogens are staphylococci and streptococci (91%) [3]. Vascular patches of Dacronu® versus that of ePTFE are less resistant to infection and are more commonly the cause of re-infections [4]. First signs and symptoms of an infection of the operation site most usually occur within the first 30 days after the procedure, however long-term complications were reported after as many as 18 months [3]. The most common signs

Figure 4. Completely healed wound after the repeated operation through primary intention, without any evidence of infection

and symptoms include neck edema, redness and cutaneous fistula, while the less common signs include that of generalized infection, hemorrhage or neurological deficits. Due to a large number of performed carotid endarterectomy procedures, effective methods of treatment of infectious complications must be provided. Therapeutic strategies involve medical treatment, excision of the prosthetic vascular patch and repeated angioplasty using a venous or biological patch. In the reported clinical case, due to the large defect of the carotid artery wall, and severe local infection, a decision was made to use biological material, CorMatrix ECM®. This is extracellular matrix obtained from submucosa of the porcine small intestine. It contains mainly type I, III, IV, V, and VI collagen (92% of dry weight) and glycosaminoglycans, glycoproteins, proteoglycans, and growth factors. It forms an acellular scaffold enabling tissue repair by patient's own cells and its remodeling typical for the tissues of the implantation site. The period between implantation and generation of a fully differentiated patient's own tissue is 4–8 weeks [5]. CorMatrix ECM® is currently utilized in cardiac surgery, for reconstruction of the pericardium, myocardium and in vascular surgery for repair of peripheral arteries. As compared to ePTFE/Dacron®, matrices of submucosa of the porcine small intestine are resistant to bacterial colonization and furthermore they stimulate local immune response through adequate neointimal response to infection [6].

A patient undergoing carotid endarterectomy should be regularly monitored for both restenosis and infectious complications. If the postoperative wound becomes infected, the patient should be hospitalized and rational antibiotic therapy should be initiated and the wound should be surgically managed. The prosthetic material must be completely excised and repeated angioplasty of the vessel should be performed using biological material. The vascular patch of the extracellular matrix CorMatrix ECM® enables successful and safe angioplasty of an artery to be performed in an infected operation site.

Ethical approval: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee, and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. This case report was approved by the local ethics committee.

Informed consent: Informed consent was obtained from all individual participants included in the study.

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Коришћење васкуларног графта *CorMatrix ECM®* за реконструкцију каротидних артерија у лечењу постоперативне инфекције ране

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САЖЕТАК

Увод Инфекција оперативног места после каротидне ендартеректомије је ретка али може да буде фатална компликација.

Циљ овог рада је био да прикаже успешну примену графта *CorMatrix ECM®* код два болесника за реконструкцију оштећених артерија услед инфекције.

Приказ болесника Код два болесника после каротидне ендартеректомије дошло је до инфекције и формирања псеудоаануризме (код једног са руптуром и масивним крварењем). У оба случаја каротидна артерија је реконструисана помоћу графта *CorMatrix ECM®* са зарастањем ране без инфекције и пуним протоком крви кроз каротидне артерије.

Закључак Графт *CorMatrix ECM®* омогућава успешну и сигурну ангиопластику артерије.

Кључне речи: инфекција оперативног места; каротидна ендартеректомија; реконструкција артерија