



## Case Report

# Inflammation and Wound Infection after Carotid Artery Endarterectomy and the Use of Biological Glue for Hemostasis

Minas Minas\*, Stavroula Tampaki

General Hospital of Rhodes, Greece

\*Corresponding author: Minas Minas, General Hospital of Rhodes, Greece

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### Abstract

The aim of the paper is to describe three cases with severe inflammatory wound reaction after the use of biological glue due to inflammation in a carotid endarterectomy operation and placement of a Dacron synthetic patch in patients with carotid stenosis, to avoid postoperative bleeding in the Vascular Surgery Department of the General Hospital Rhodes.

**Keywords:** Carotid endarterectomy; Carotid stenosis; Synthetic graft inflammation; Biological glue

### Description of Incidents

The first case (A) is a 70-year-old woman with a history of recent T.I.A due to symptomatic 80% stenosis of the right internal carotid artery (recent stroke, 2 months before surgery). The patient was receiving clopidogrel 75 mg daily and statin 10 mg daily. The patient underwent a successful right internal carotid endarterectomy and a carotid patch (Dacron) was placed and sutured with a 5.0 prolene suture to the carotid wall. The hemostat that was used was removed and biological glue was applied. Her postoperative course was satisfactory, during which she received antibiotic treatment with ciprofloxacin 1x2 i.v for 4 days, vancomycin 1x2 i.v for 3 days. On the fifth postoperative day the patient was discharged with instructions and per os antibiotic treatment with ciprofloxacin 500 mg 1x2 i.v and clindamycin 300 mg i.v s: 1x3 for 6 days. Twenty days after the operation, the patient was admitted to our department due to inflammation of the surgical incision. A carotid CT scan with intravenous contrast was performed which confirmed the infection. Blood culture revealed epidermal staphylococcus with an increase in white blood cells (WBC: 12.5 K/ $\mu$ L, NEUT: 74.9%) and CRP (7.20 mg/dl). The patient did not show febrile movement and for 3 days she received the appropriate treatment according to the antibiogram (Clindamycin 600 mg s: 1x3 iv). Her clinical picture did not improve and so it

was decided to proceed with surgical treatment. The old incision was opened and the carotid artery was prepared. Synthetic carotid embolization (Dacron) showed evidence of intense inflammatory infiltrate, without evidence of hemorrhage. The graft was then removed and replaced with a Great Saphenous Vein (GSV) graft. Postoperatively, the patient continued with the same preoperative antibiotic treatment. The course of her hospitalization was very good and she was discharged on the fifth postoperative day. The patient did not present inflammation at the surgical incision again and in the third postoperative month a new carotid triplex was performed which was normal, without a picture of new inflammation or pseudoaneurysm.

The second case (B) is a 77-year-old man with asymptomatic right carotid disease (98%) and a history of type 1 diabetes mellitus, coronary artery disease, arterial hypertension and hypercholesterolemia. He was treated with insulin glargine 28 IU sc, gliclazide 50 mg, clopidogrel 75 mg and statin 20 mg daily. A right internal carotid endarterectomy was performed after 1 week in which the carotid plaque was successfully removed and the synthetic carotid graft (Dacron) sutured with prolene 5.0 suture to the carotid walls. The hemostatic used due to minor intraoperative bleeding was removed and biological glue was used. After 15 days, he was admitted to our clinic due to inflammation of the surgery. In the laboratory control of leukocytosis (WBC: 16.61K/ $\mu$ L with NEUT: 80.5%) and (CRP: 8.90 mg/dl). Epidermal staphylococcus was found in the blood culture and antibiotic treatment was

introduced according to the antibiogram (ciproxin 1X2 iv). The inflammation after the second postoperative day started to subside and on the eighth day of his hospitalization it completely subsided, which was also confirmed in the carotid triplex. On the 10th day of hospitalization the patient was discharged with the same oral regimen for 6 days. The patient had no recurrence of inflammation of the surgical incision and the new carotid triplex after 3 months showed no evidence of inflammation or pseudo aneurysm.

The third case (C) is a 72-year-old man with symptoms of darkening of the right eye due to 80% stenosis of the common carotid artery. In the individual memoir, there is a history of arterial hypertension under treatment with valsartan (160+12.5 mg), benign prostatic hypertrophy. This was followed by right internal carotid endarterectomy and placement of a carotid synthetic carotid graft (Dacron). The hemostatic used was removed and biological glue applied. After 5 days of hospitalization, the patient was discharged in good general condition and with antibiotic treatment. After 2 months, the patient was admitted to our clinic due to inflammation of the surgical incision. *Pseudomonas aeruginosa* was found in the blood culture, blood tests revealed WBC: 20.03K/ $\mu$ L -NEUT: 85.2%-CRP: 10.82 mg/dl, and he was treated according to the antibiogram (piperacillin, tazobactam iv). The inflammation did not subside and on the sixth postoperative day, a surgical procedure was performed in which the synthetic embolization (Dacron) was removed and it was repaired with a vein graft from the right GSV. The patient continued the same antibiotic treatment and on the seventh postoperative day, he was discharged in good condition. In a recheck done 3 months later with carotid triplex, no picture of inflammation or bleeding was found.

## Discussion

Surgical incision infection after endarterectomy. Infection after carotid endarterectomy (CEA) is a rare but devastating complication (Clark J. Zeebregts et al 2010. A variety of different treatment options have been reported. However, there is currently no consensus on how to manage this highly morbid problem.

Local sepsis is an extremely uncommon complication of CEA (a MD etc. 2011, and the previous literature contains only scattered reports of carotid infections after repair of primary arteriotomy or vein graft angioplasty. These infections, which are usually caused by gram-positive bacteria, are almost always found to have penetrated the arterial wall. Therefore, in the past, resection of the carotid bifurcation and construction of a venous bypass graft in the ICA was recommended because the risk of stroke was much lower with vein grafts than with carotid ligation. However, our current experience shows that a synthetic patch infection can be limited to the patch itself and can often be treated safely by replacing the infected patch with a new graft (Sremska Kamenica

etc. Serbia, and Paris, France 2013, from the great saphenous vein collected from the inguinal region.

Although we still believe that vein patch angioplasty has an established role in CEA (A.R. Naylor et al. 2012, we do not intend to condemn synthetics, especially Dacron, just because of our current experience with few synthetic patch infections. Synthetic patches have relatively low complication rates by any standard and appear to provide significant protection against recurrent stenosis compared with closure of the original arteriotomy. Infection with the synthetic patch may be an accidental (Alexander W. Clowes, MD etc.2006, unavoidable event, such as rupture of the vein carrier, however, there could also be underlying causal mechanisms that have not yet been fully appreciated.

Carotid sheath infection is a well-documented complication of CEA with a prevalence of between 0.27% and 1%. It often presents as a pseudoaneurysm (Russell A. Williams, MD etc. 2003), swelling of the sinuses or neck. The highest incidence occurs in the first year after surgery and especially in the first three months after the attack, due to infections or wound infections (Knight and W.F. Tait 2009). Bacterial cultures are positive in about 80% of cases, increasing mainly gram positive cocci. Other organisms include *Pseudomonas* and *Enterobacter*.

The most common infecting organisms are staphylococci/streptococci (90%) and this should be considered when planning antibiotic treatment before cultures are obtained. Most skin infections with partial or total patch rupture are relatively rare (10%), thus allowing the surgeon to carefully assess the patient's overall clinical and anatomical condition while planning the optimal treatment strategy. If necessary, the patient should be transferred to a tertiary center for treatment. This is not an operation that should be undertaken by an inexperienced surgeon. Excision of the infected elements and autologous reconstruction (usually veins) is the current "gold standard" treatment, but highly selected patients can be successfully treated with less invasive surgery (including the insertion of a covered stent). Prosthetic reconstruction should be avoided.

The aldehyde-base glue used, Biological glue<sup>®</sup> surgical glue (CryoLife Inc., Kennesaw, GA), is a two-component agent consisting of 45% purified bovine serum albumin (BSA) and 10% glutaraldehyde. The two components are dispensed from a double syringe and mixed within the dispensing tip in a predetermined ratio. Glutaraldehyde molecules covalently bind BSA molecules to each other and, upon application, to tissue proteins at the repair site, creating a mechanical seal independent of the coagulation cascade. Because Biological glue does not contain formaldehyde, it is considered less toxic than GRFG. Biological glue was approved for use by the FDA in 2001 and has since been used in almost every country in the world.

## Conclusions

Inflammation of the surgical incision and synthetic carotid graft after carotid endarterectomy is a potentially devastating complication. The infection is not very common but we should not underestimate it either. Our small experience in three cases showed us how the use of biological glue in endarterectomy operations and restoration with synthetic embolization not only offers a great hemostatic capacity but also a large percentage of postoperative inflammation, which had also infiltrated the surrounding tissues. Since then, we have not used it again in a carotid endarterectomy, and no inflammatory complications have occurred in subsequent similar operations.

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