Eur J Vasc Endovasc Surg (2016) 52, 281–286

REVIEW

Fate of Distal False Aneurysms Complicating Internal Carotid Artery Dissection: A Systematic Review

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WHAT THIS PAPER ADDS

The fate of nonoperated false aneurysms complicating internal carotid artery dissections is unknown. This systematic review observed that false aneurysms rarely became symptomatic and rarely increased in size, suggesting that the majority should be treated conservatively. As nearly all studies suffered from serious bias, reporting standards for diagnosis and follow-up are needed in order to better define their natural history.

Background: False aneurysm formation occurs in 13–49% of internal carotid artery dissections (ICADs). In light of the uncertainty regarding the clinical course, expansion rates and optimal treatment of post-ICAD false aneurysms, a systematic review of the literature was undertaken to establish the fate of the nonoperated distal ICA false aneurysm after ICAD.

Methods: PubMed/MEDLINE, Embase, and Cochrane databases were systematically searched up to 13 August 2015 for studies reporting clinical outcomes and imaging surveillance in patients who were found to have developed a false aneurysm associated with ICAD, with specific emphasis on the fate of the nonoperated false aneurysm.

Results: Eight studies reported on the course/clinical outcome of ICAD-associated false aneurysms in 166 patients. Of these, five of 166 false aneurysms (3%) increased in size; 86 of 166 (52%) remained unchanged in diameter; 35 of 166 (21%) diminished in size; 32 of 166 (19%) resolved completely; three of 166 (2%) thrombosed; and five 166 (3%) were repaired surgically. Another four of 166 (2%) underwent late surgery (0.5–5.0 years later). During the course of surveillance, none of the nonoperated false aneurysms associated with spontaneous ICAD gave rise to any new neurological or compressive symptoms.

Conclusions: In this systematic review, >95% of nonoperated false aneurysms affecting the distal internal carotid artery that developed after an ICAD did not increase in size and were not associated with any delayed neurological symptoms suggesting that conservative management and serial surveillance is the optimal mode of treatment. As nearly all studies suffered from serious bias, reporting standards for diagnosis and follow-up are needed in order to better define their natural history.

Article history: Received 19 December 2015, Accepted 17 March 2016, Available online 22 April 2016
Keywords: Dissecting aneurysm, False carotid aneurysm, Internal carotid artery dissection

INTRODUCTION

Spontaneous or traumatic internal carotid artery dissections (ICADs) result from a tear in the intima of the internal carotid artery (ICA), usually about 2–3 cm above the carotid bifurcation. This leads to accumulation of blood and a separation of arterial layers within the ICA, with the end result being a stenosis (where thrombus in the false lumen partially compresses flow within the true lumen), complete occlusion (if thrombus in the false lumen completely obstructs flow within the true lumen), or false aneurysm formation (where accumulation of blood is subadventitial).[1–3] False aneurysms are reported to complicate 13–49% of all ICADs.[4–9]

The highest risk period for suffering a stroke after ICAD is the first 7 days,[1–3,8–10] and the first-line treatment is

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http://dx.doi.org/10.1016/j.ejvs.2016.03.021

usually dual antiplatelet or anticoagulant therapy, in order to prevent thromboembolic stroke.[1–3,8–10] Following imaging (usually computed tomography [CT]/magnetic resonance angiography [MRA]), patients with ICAD may be found to have a false aneurysm affecting the distal ICA (Fig. 1), raising the question of how best these should be managed in the long term. The literature contains a number of reports detailing outcomes after open and endovascular repair of false aneurysms after ICAD, but the indications for recommending an intervention remain inconsistent.[6,11–17] Where ICAD false aneurysms have been associated with focal neurological or compressive symptoms, a more invasive approach can be justified.[6,15] However, there is considerable uncertainty regarding the optimal management of asymptomatic false aneurysms, particularly if they do not increase in size.

The aim of the current systematic review was to ascertain the natural history of nonoperated false aneurysms associated with ICAD, with specific reference to aneurysm regression/progression, development of late symptoms and the need for surgical or endovascular intervention.

MATERIALS AND METHODS

A systematic review was undertaken according to the recommendations of the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) statement.[18] The PRISMA checklist with a related appendix (participants, interventions, comparisons, and outcomes) is detailed in Fig. 2 (see also Appendix in Supporting Information).

Figure 1. Three-dimensional computed tomography angiography in a 31-year-old man who suffered an acute carotid dissection with false aneurysm formation (plus a distal stenosis) in the upper internal carotid artery. This aneurysm remained unchanged in size over 3 years of imaging surveillance and was not associated with any further symptoms.

PubMed/MEDLINE, Embase, and the Cochrane databases were independently searched by two investigators (K.I.P., A.J.B.) up to 13 August 2015 in order to identify studies reporting the clinical course of nonoperated false aneurysms complicating ICAD. By use of the medical subject heading terms “carotid artery dissection AND aneurysm”, a total of 2,306 reports were identified. The abstracts of these reports were read, and full-text articles retrieved where relevant. Only English-language reports were considered. Studies reporting on the same series of patients were excluded. Single case reports were not included. The data were extracted independently by two reviewers (K.I.P and A.J.B.). Any discrepancies were resolved by a third reviewer (A.R.N.).

ASSESSMENT OF BIAS

As this was a review of small observational studies, potential sources of bias were looked into (Table 2). Selection bias was defined as missing information on baseline characteristics. Information bias was defined as absence of reporting how the aneurysm was assessed during follow-up (imaging modality/measurement protocol). Attrition bias was assumed to be present when not all participants were accounted for because they were lost to follow-up. Assessment of confounding was limited to assessment whether any factors that could influence the natural history were taken into account (such as single or dual antiplatelet therapy).

RESULTS

The systematic review identified 2,306 potential papers for inclusion (Fig. 3). After duplicate reports were excluded, 2,301 abstracts were reviewed and 1,940 papers excluded. After a review of the full text in the remaining 361 studies, 353 were excluded, leaving eight studies for inclusion in the systematic review.[6–9,13,14,19,20]

Table 1 details clinical and surveillance outcomes in 166 patients with a nonoperated false aneurysm complicating ICAD from the eight published series.[6–9,13,14,19,20] Forty false aneurysms (24%) followed traumatic ICAD, while 126 (76%) were classed as having occurred following spontaneous ICAD. The mean follow-up period for the 166 patients was 38.5 months (range 1 month–15 years). The demographic data, sex ratios, and/or aneurysm sizes were not specified in six of the eight studies.[6,7,9,14,19,20]

Overall, only five of 166 false aneurysms (3%) increased in size during follow-up. Of the remainder, 86 of 166 false aneurysms (52%) remained unchanged in size; 35 of 166 (21%) diminished in size, while 32 of 166 (19%) resolved completely. Three false aneurysms (2%) spontaneously thrombosed (along with the ICA) without causing symptoms. Accordingly, 161 false aneurysms (97%) either remained unchanged in size or regressed/resolved.

Only four patients with an initially nonoperated false aneurysm after traumatic ICAD (2%) developed new neurological symptoms during follow-up and all were from the same publication.[6] No further clinical details were