



Orbital Approaches for Treatment of Carotid Cavernous Fistulas: A Systematic Review

Kevin Phan^{1,3}, Joshua Xu^{1,3}, Vanessa Leung², Ian Teng^{1,2}, Sharaf Sheik-Ali⁴, Monish Maharaj^{1,2}, Ralph Mobbs¹, Prashanth J. Rao^{1,2}

Key words

- Carotid cavernous fistula
- Embolization
- Orbital approach
- Outcome
- Systematic review
- Transvenous

Abbreviations and Acronyms

CCF: Carotid cavernous fistula
IOV: Inferior ophthalmic vein
IPS: Inferior petrosal sinus
MOV: Medial ophthalmic vein
SOV: Superior ophthalmic vein

From the ¹NeuroSpine Surgery Research Group (NSURG), Prince of Wales Private Hospital, Sydney, Australia; ²University of New South Wales (UNSW), Sydney, Australia; ³University of Sydney, Sydney, Australia; ⁴Barts and The London School of Medicine and Dentistry, London, United Kingdom

To whom correspondence should be addressed:

Kevin Phan, B.Sc. (Adv)

[E-mail: kpha5955@uni.sydney.edu.au]

Citation: *World Neurosurg.* (2016) 96:243-251.

<http://dx.doi.org/10.1016/j.wneu.2016.08.087>

Journal homepage: www.WORLDNEUROSURGERY.org

Available online: www.sciencedirect.com

1878-8750/\$ - see front matter © 2016 Elsevier Inc. All rights reserved.

INTRODUCTION

Carotid cavernous fistulas (CCFs) are abnormal connections between the carotid arteries and the cavernous sinus. CCFs can be classified as 2 main subtypes, either direct high-flow CCFs or indirect low-flow CCFs.¹ Direct CCFs result from defects in the wall of the intracavernous carotid artery, which causes it to be in direct communication with the surrounding cavernous sinus.¹ This type of CCF often occurs as a result of trauma to the head and is most common in young men.² Indirect CCFs, also called dural arteriovenous fistulas, are pathologic connections between the cavernous sinus and the branches of the carotid arteries within the dura mater. The presentation of this subtype of CCF is seen more commonly in postmenopausal women.^{3,4} Nevertheless, all types of CCFs result in

■ **BACKGROUND:** Carotid cavernous fistulas (CCFs) are abnormal connections between the carotid arteries and the cavernous sinus. CCFs often present with double vision, reduced visual acuity, and conjunctivitis. Deteriorating ocular symptoms caused by abnormal fistula drainage can cause permanent blindness, and so urgent interventional treatment is necessary. Transvenous embolization of the fistula is the primary treatment option for most patients with symptomatic CCFs. Orbital approaches are considered to be risky compared with the traditional approach via the inferior petrosal sinus and are thus used as a secondary option. These approaches include embolization via the superior ophthalmic vein, inferior ophthalmic vein, and medial ophthalmic vein and direct transorbital puncture. This study aims to assess the merits and risks of orbital approaches in transvenous embolization of CCFs.

■ **METHODS:** A systematic review of 30 studies assessing the radiographic and clinical outcomes of this approach was conducted. Outcomes of interest included successful fistula closure, postoperative improvement of ocular symptoms, and complications from the procedure. Weighted averages were calculated for all outcomes.

■ **RESULTS:** Transvenous embolization via an orbital approach had a high success rate (89.9%). Improvement in visual acuity and proptosis was found in 93.4% and 88.1% of patients, respectively. There were no major complications. Minor complications found included subconjunctival hemorrhage ($n = 4$), intraorbital hemorrhage ($n = 1$), eyelid hematoma ($n = 1$), and foreign-body granuloma ($n = 3$).

■ **CONCLUSIONS:** All orbital approaches for transvenous embolization of CCFs are effective and safe.

increased blood flow and pressure within the cavernous sinus, typically resulting in fistulous flow draining into the orbital veins. The characteristic symptoms of this condition include reduced visual acuity, proptosis, chemosis, diplopia, and increased intraocular pressure.

Although some indirect CCFs can close spontaneously with conservative management, many cases of CCFs require interventional treatment to close the fistula.⁵ Endovascular treatments are most common and involve using an arterial or venous approach to reach the fistula. Embolization of the fistula can then be achieved by using a variety of substances such as platinum coils, Guglielmi detachable coils, detachable balloons,

and liquid adhesives. In direct CCFs, a transarterial route is preferred; however, the small, tortuous arterial branches in indirect CCFs make this approach difficult. Therefore, transvenous embolization is typically used as a first option for treating all indirect CCFs or direct CCFs that have failed to resolve after transarterial embolization. Conventionally, transvenous embolization is achieved by an approach through the inferior petrosal sinus (IPS). However, when the IPS cannot be angiographically visualized or has thrombosed, alternative approaches via transorbital pathways have been used.

Embolization of the CCFs via the superior ophthalmic vein (SOV), inferior

ophthalmic vein (IOV), and medial ophthalmic vein (MOV) has been successful in a variety of studies. Direct transorbital puncture into the cavernous sinus has also been implemented in some cases. Although an orbital approach is a direct and efficient way of accessing the cavernous sinus, it is not initially preferred, because studies have suggested that it may be more risky and elicit more complications than the traditional trans-femoral approach through the IPS.⁶ Thus, to assess the merits and risks of an orbital approach, a systematic review was performed to investigate the clinical outcomes of transvenous embolization via an orbital approach for patients with CCF.

METHODS

Literature Search

A systematic literature review was conducted for studies that described an orbital approach for the treatment of CCFs. Six electronic databases were used: Ovid MEDLINE, PubMed, Cochrane Central Register of Controlled Trials, Cochrane Database of Systematic Reviews and the American College of Physicians Journal Club, and the Database of Abstracts of Review of Effectiveness (DARE). These databases were searched from the date of inception to April 2016. To maximize search sensitivity to identify all relevant studies, a combination of the terms “orbital”, “ophthalmic”, “carotid cavernous fistula”, and “embolization” were searched as either keywords or MeSH (Medical Subject Headings) terms. The reference lists of all retrieved articles were reviewed for further identification of potentially relevant studies. All identified articles were systematically assessed using the inclusion and exclusion criteria.

Selection Criteria

Eligible studies included those in which the patients had CCFs, with the treatment plan being transvenous embolization via an orbital approach. Studies describing various transvenous approaches for CCF were included only if the outcomes of the orbital approach group were reported separately. When institutions reported studies that had accumulating patient numbers and thus duplicate data, only the

most complete report was included. All the included publications were limited to those on human subjects and available in the English language. Conference presentations, expert opinions, editorials, and review articles were omitted.

Data Extraction and Critical Appraisal

The primary outcomes of interest included the radiographic and clinical outcomes of the patients. These outcomes primarily included the postoperative improvement of proptosis, diplopia, chemosis, conjunctival injection, ocular movement, ocular acuity, and ocular pressure. Successful closure of the fistula via embolization was also noted and radiographically determined in most studies. All complications were noted along with the vessel and embolic materials used for the orbital approach procedure. The data were all extracted from the text, tables, and figures of the article. Two investigators (J.X. and K.P.) independently reviewed and extracted the data from all the included studies. The quality of each article was assessed and any discrepancies between the reviewers were resolved by discussion and consensus. The weighted averages for the outcomes were calculated by dividing the total events by the total sample size.

RESULTS

Literature Search

Through the 6 electronic databases, 297 studies were identified using the search criteria. By applying the inclusion and exclusion criteria, 30 studies were included in the final systematic review. These studies consisted of 19 case studies, 9 retrospective observational studies, and 2 technical articles, which reported relevant patient outcomes for the orbital procedure. No randomized evidence was available.

Demographics and Surgical Approach

A total of 140 patients underwent treatment of CCF via an orbital approach. Overall, 38.0% of the patients were male, with the weighted average age of the all patients being 62.3 years. The primary approach used for the orbital approach was transvenous embolization via the SOV, which was performed in 69 patients. Transvenous embolization via the IOV was described in 1

case and transvenous embolization via the MOV was described in 2 cases. Direct transorbital puncture into the cavernous sinus was completed in 16 cases, and direct percutaneous puncture into the SOV and IOV was performed in 15 cases and 1 case, respectively. The most common embolic agent used was coils with more recent studies also using an Onyx (Covidien, Dublin, Ireland) nonadhesive liquid embolic agent. The characteristics of the study are summarized in **Table 1**.

Outcomes

Most studies reported if closure of the embolization was successful. From the pooled patients, the rate of successful embolization of the fistula via an orbital approach was 89.9%. The reporting of specific outcomes was not always noted in the studies. Improvement in visual acuity along with reduced or resolved proptosis was found to be respectively 93.4% and 88.1% of the pooled patients who reported this criterion. For all patients who underwent successful fistula embolization, there were notable improvements in chemosis, diplopia, ocular movement, ocular pressure, and preoperative headaches. The few patients who did not show postoperative improvements also did not have successful embolization of the fistula. There were no major complications for the patients who had their CCF successfully obliterated. Subconjunctival hemorrhage was found postoperatively in 4 patients from the percutaneous puncture approach. There was 1 case of intraorbital hemorrhage and 1 case of eyelid hematoma. There were 3 cases of foreign-body granuloma as a result of using silk ligatures. Improvements in clinical symptoms along with complications are summarized in **Table 2**.

DISCUSSION

The symptoms of CCFs can often present as common ocular conditions such as double vision, reduced visual acuity, and conjunctivitis, making early diagnosis difficult.³⁷ Most indirect CCFs are not life threatening; however, deteriorating ocular symptoms caused by abnormal fistula drainage can cause permanent blindness, and so urgent interventional treatment is necessary. Transarterial embolization of CCFs can be used but is more technically difficult than the

Download English Version:

<https://daneshyari.com/en/article/5635073>

Download Persian Version:

<https://daneshyari.com/article/5635073>

[Daneshyari.com](https://daneshyari.com)