Orbitofrontal Cholesterol Granuloma: Four Case Reports and a Systematic Review of the English Literature

Joshua D. Hughes[1], Jeffery T. Jacob[1], James A. Garrity[2], Diva R. Salomao[3], Michael J. Link[1]

Key words
- Cholesterol granuloma
- Chronic hematic cyst
- Orbital cholesterol granuloma
- Orbitofrontal cholesterol granuloma

Abbreviations and Acronyms
CG: Cholesterol granuloma
OFCG: Orbitofrontal cholesterol granuloma
MRI: Magnetic resonance imaging

From the Departments of [1]Neurologic Surgery, [2]Ophthalmology, and [3]Pathology, Mayo Clinic School of Medicine, Rochester, Minnesota, USA

To whom correspondence should be addressed: Michael J. Link, M.D. [E-mail: link.michael@mayo.edu]

Citation: World Neurosurg. (2016) 87:355-361.
http://dx.doi.org/10.1016/j.wneu.2015.11.095

Journal homepage: www.WORLDNEUROSURGERY.org

Available online: www.sciencedirect.com

INTRODUCTION: **Primary orbitofrontal cholesterol granuloma (OFCG) is rare. We present 4 cases of OFCG and a systematic literature review to examine patient characteristics, presentation, treatment, and outcome.**

METHODOLOGY: **Our institutional records were reviewed for OFCG cases. A systematic literature review was performed using PubMed. Inclusion criteria were English-language studies with pathology-proven OFCG. Exclusion criteria were OFCG in a craniofacial sinus. The search-string yielded 172 results. Fifty studies met inclusion criteria (39 primary and 11 secondary), and relevant data were reviewed.**

RESULTS: **Four patients underwent surgery for OFCG at our institution (ages 53, 43, 34, and 43; 3 females, 1 male). All patients were treated with surgery using a tailored frontal-orbital craniotomy with complete resection. There was no recurrence at 12-month, 4-year, 10-year, and 22-year follow-up for each patient, respectively. Systematic review of the literature identified 172 patients. Follow-up was available in 93 patients (54.1%) with a mean follow-up of 43.3 months. Seven patients demonstrated recurrence at a median of 36 months following surgery. Combining our 4 cases with the 93 patients with reported follow-up gives a recurrence rate of 7% (7/97). Recurrence was associated with incomplete resection and an orbital approach.**

CONCLUSION: **Thorough removal of the lesion with curettage of the boney cavity is recommended for OFCG. Recurrence following complete removal of OFCG is rare.**

INTRODUCTION

Cholesterol granuloma (CG) occurs secondary to an inflammatory response to the breakdown of blood products.[1–5] The most prominent features of CG are cholesterol clefts with granulomatous inflammation without epithelial elements (which distinguishes CG from cholesteatoma).[6] CG occurs most commonly in the petrous apex but has rarely been reported to occur in other regions of the head, including the orbit. Historically, orbitofrontal CG (OFCG) occurs most commonly in the lacrimal fossa and has been labeled cholesteatoma, lipid granuloma of the frontal bone, xanthomatosis of the orbit, and chronic hematic cyst.[4,7–10] Although there are case reports and small case series on OFCG, no systematic literature review has been done to examine patient characteristics, presentation, treatment, and outcomes. We present 4 cases that occurred at our institution and a systematic review of the English language literature.

METHODS

After institutional IRB approval, the medical records at our tertiary medical center were reviewed for cases of OFCG and 4 cases were discovered. A PubMed search was performed on January 11, 2015 using the following string: *"cholesterol granuloma" OR "lipid granuloma" OR "hematic cysts" OR "hematic cyst" OR "chronic hematic cyst" OR "xanthomatosis" AND (frontal OR orbit OR orbital OR orbitofrontal) NOT sinus [title]*. The PubMed search yielded 172 results, and 49 potential primary studies were found and screened for further sources not found in the PubMed search (secondary sources). Exclusion criteria were non-English reports, animal studies, and undocumented pathology or imaging confirming OFCG. Using these criteria, 80 potential sources (49 primary and 31 secondary) were identified, 30 were excluded, and 50 met inclusion criteria (39 primary and 11 secondary). See Figure 1, a flow diagram, for systematic literature review. All patients (both institutional and from the literature review) were reviewed for patient demographics, signs and symptoms, history of trauma, imaging, intracranial extension, surgery, recurrence, and length of follow-up. Various surgical approaches were categorized as a limited orbital or scalp flap approach and were analyzed for recurrence with a chi-square test. A P value < 0.05 was considered statistically significant.

RESULTS

Case 1

A 53-year-old female presented recently with 5 months of left ocular displacement and 3 months of uncomfortable periorbital pressure sensation. On examination, she had intact extraocular movements and

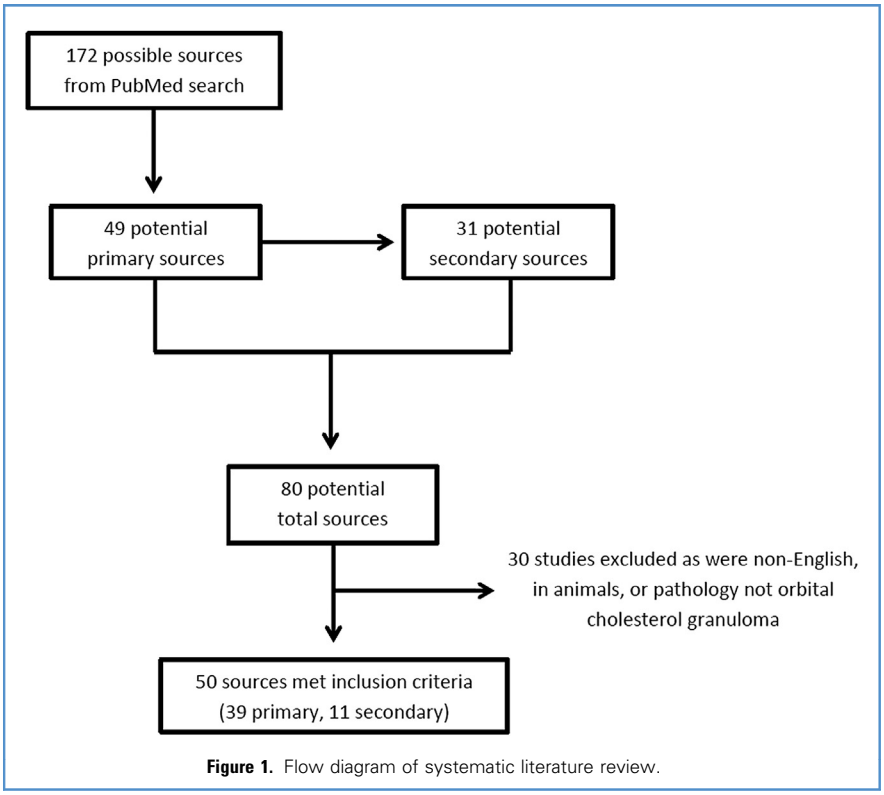

Figure 1. Flow diagram of systematic literature review.

normal visual acuity and visual fields to confrontation in both eyes. Her left globe was depressed. Magnetic resonance imaging (MRI, Figure 2) showed an abnormality in the left frontal bone expanding into the superior left orbit displacing the globe inferiorly. It had an expansile appearance and was T1 and T2 hyperintense with patchy mild enhancement and no restricted diffusion (Figure 2B and C). She underwent a left orbitofrontal craniectomy with complete evacuation of the cyst contents and drilling of the boney cavity. Pathology was consistent with CG (Figure 3). She had no recurrence at 12-month follow-up (see Figure 2D).

Case 2

A 43-year-old female presented with headaches and 1.5-year history of increasing left eye swelling. On further history, she reported that people had noticed her left eye appeared different than her right for 20 years, which was confirmed by pictures. She endorsed occasional double vision. On examination, she had downward displacement of the globe with proptosis of 2–3 mm and restricted left upper gaze. Computed tomography (CT) of her head showed a 2.5-cm expansile cystic mass in the left lacrimal fossa. No MRI was done. She underwent a left frontotemporal craniotomy with left superior orbitotomy. The defect had eroded into the anterior fossa but did not invade the dura. The defect was curettaged until no membranes remained. There was no recurrence at 120 months.

Case 3

A 34-year-old male presented with 8 months of blurred vision and a sensation of pressure in his right eye. He had a remote history of trauma to the temporal area 4–5 years prior. On examination he had 1 mm of proptosis and 2 mm of globe displacement. CT of his head showed a mass in the right lacrimal fossa with erosion into the right frontal sinus. MRI showed a 1.5-cm mass that was bright on T1- and T2-weighted images. There was no enhancement. He underwent a right frontal craniotomy through a bicoronal flap. A small frontal craniotomy was performed around the lesion and was removed en bloc. The frontal sinus was breeched, and the pericranium was used to exclude the sinus. He has had no recurrence at 264 months.

Case 4

A 43-year-old female presented with a sensation of pressure behind the right eye that had been increasing for a few years. She had no history of trauma. Her examination was significant for 3 mm of right eye proptosis and 2 mm of displacement. CT showed a uniform soft tissue mass in the right lacrimal fossa that measured 2.5 cm with boney destruction of the lateral orbit and middle fossa. There was no enhancement on MRI. She underwent a right frontotemporal craniotomy. There was no erosion of the lesion into the periorbital or dura, and it was removed with curettes. There was no recurrence at 48 months.

Systematic Literature Review

In 50 studies, 172 patients were found with pathologically confirmed OFCG.[1-50] The studies were published between 1934 and 2015 (median 1994). The median number of patients in each study was 1 (range, 1–31). See Table 1 for a list of included studies and patient demographics.

The mean patient age was 42 (range, 14–83) years, and 154 (89.5%) patients were male. There was no history of trauma in 117 (68.0%) patients, and 37 (21.5%) patients had either a remote or recent trauma history. The most common presenting symptom and physical examination finding was proptosis (61.6% and 84.9%, respectively). See Table 2 for a complete listing of patient signs and symptoms and physical examination findings. The most common location was either the right (n = 77, 44.8%) or left (n = 60, 34.9%) superolateral portion of the orbit. The location was unspecified in 31 (18.0%) patients.

Regarding symptoms, patients complained of the following: 106 (61.6%) eye protrusion, 62 (36.0%) eye swelling, 53 (30.8%) diplopia, 35 (20.3%) pain, 21 (12.2%) vision changes, and 8 (4.7%) eye displacement. The mean duration of symptoms before diagnosis was 20.5 (0.25–312) months. On physical examination findings, patients suffered from the following: 146