Ophthalmic Plastic and Reconstructive Surgery
Vol. 17, No. 2, pp 149–154

Letters to the Editor

Orbital Involvement in Allergic Fungal Sinusitis

To the Editor:

Chang et al.[1] described three cases of allergic fungal sinusitis (AFS) with orbital involvement but omitted several pertinent issues. Allergic fungal sinusitis is a recently recognized form of noninvasive paranasal sinus mycosis believed to occur in up to 7% of patients with chronic sinusitis.[2] Although as many as 17% to 18% of patients with AFS may experience ophthalmic manifestations,[3,4] there have been few reports in the ophthalmic literature describing orbital disease caused by AFS.[5–12] We appreciate the experiences of Chang et al.[1] in the management of AFS as a useful addition to the literature. Their report, however, provided a limited description of the typical presentation of AFS and did not adequately reference previously reported cases of AFS with orbital involvement.

The authors did not cite our report[11] and those of others[5,8,9,12] describing orbital disease caused by AFS. In addition, Chang et al.[1] only cited one case report of decreased vison.[6] There have actually been several other reports of vision loss caused by AFS.[7,12–18] In a retrospective review of 82 patients with AFS, Marple et al.[4] also described 3 patients (3.7%) with reversible vision loss. Fortunately, in most cases vision loss caused by AFS is reversible with evacuation of the involved sinuses and allergic mucin.

In our 1997 report of two cases of orbital involvement in AFS,[11] we reviewed the current classification of fungal sinusitis and outlined the unique clinical, radiologic, and pathologic features of AFS. Carter et al.[12] have also provided a comprehensive review of the ophthalmic manifestations of AFS. It is essential for ophthalmologists and particularly specialists in orbital disease to be aware of the highly characteristic presentation of AFS. Patients with AFS often have ophthalmic symptoms or signs, so clinical suspicion is critical to establish a prompt diagnosis.

Allergic fungal sinusitis is a noninvasive form of fungal sinusitis typically occurring in young, immunocompetent, atopic patients living in warm, humid climates. The pathophysiology of AFS has not been fully elucidated; however, most investigators believe that AFS represents an immunologically mediated hypersensitivity disorder similar to allergic bronchopulmonary aspergillosis and not a true infection.[19] It has been postulated that inhaled fungal antigens in susceptible individuals result in a type I and type III hypersensitivity inflammatory response.[20,21] Manning and Holman[22] have provided experimental evidence supporting the role of immunoglobulin (Ig)E- and IgG-mediated hypersensitivity reactions resulting in the release of eosinophilic mediators. Hypertrophic rhinosinusitis then ensues with functional sinonasal obstruction and the accumulation of peanut-buttery inspissated allergic mucin containing fungal hyphae, embedded eosinophils, Charcot-Leyden crystals, and major basic protein. Further anatomical obstruction leads to perpetuation of the "AFS cycle" and expansion of the allergic mucin with involvement of adjacent structures, including the orbit and optic canal.

The criteria for establishing the diagnosis of AFS continue to evolve. Bent and Kuhn[23] initially proposed five criteria: type I hypersensitivity (history, skin test, or serology), nasal polyposis, characteristic radiographic findings, allergic mucin, and extramucosal fungal hyphae or positive fungal cultures. In a review of seven patients with AFS, deShazo and Swain[24] excluded atopy as a diagnostic criterion. Schubert and Goetz[25] have suggested that the classic computed tomography findings are not present in all patients and that the diagnosis of AFS can be confirmed by the histopathologic findings outlined by Bent and Kuhn[23] as well as sinus mucosal staining characteristics indistinguishable from the mucosal infiltrate in asthmatic bronchial mucosa. In their review of 67 consecutive cases 75% of patients had nasal casts and 100% were atopic. Of patients who had skin tests, all had a positive reaction to the specific mold associated with their

AFS. Peripheral eosinophilia was not a prominent feature; however, total serum IgE was generally elevated. Importantly, a follow-up study by Schubert and Goetz[26] demonstrated a reduction in total serum IgE after surgical debulking. The authors concluded that serial serum IgE titers might be a useful prognostic indicator in determining patients at risk for recurrence.

Conversely, a prospective study of 97 patients with AFS at the Mayo Clinic[27] detected elevated total IgE in fewer than 33% of patients with AFS, and only 42% had a positive skin test. These investigators concluded that atopy is not an essential diagnostic criterion and that allergic mucin is a misnomer and not the result of an IgE-mediated type I hypersensitivity response. They proposed a change in terminology from AFS to eosinophilic fungal rhinosinusitis. Still others[28] disagree with this conclusion.

Because the imaging characteristics seen with AFS are highly specific, it is worth elaborating on this aspect of the diagnosis. Nonenhanced computed tomography scans typically reveal multiple sinus involvement with mottled areas of increased attenuation.[29] Bone erosion and remodeling are often evident but do not signify actual mucosal invasion. Juxtaposed bone resorption is presumably caused by the presence of cytokines and eosinophil products in allergic mucin.

Magnetic resonance imaging is more specific than computed tomography scans in diagnosing AFS. As Chang et al.[1] briefly stated, T1-weighted images show isointense or slightly hypointense signal intensity. T1-weighted images may look similar to bacterial sinusitis or neoplastic disease. T2-weighted images demonstrate a marked decrease in signal intensity.[29] This signal void may be mistaken for air unless an opacity is noted on either the T1-weighted image or computed tomography scan. In addition, inflammation of the sinus mucosa may result in a hyperintense signal on both T1-weighted and T2-weighted images.

As mentioned by Chang et al.,[1] the optimal treatment of AFS has not been established. Debridement of fungal debris and aeration of the involved sinuses is critical. Postoperative treatment with topical and oral corticosteroids has been effective in diminishing the risk of recurrent disease. The three patients in their report were treated with surgical debridement, less than 1 month of systemic corticosteroids, and maintenance intranasal corticosteroids (12–36 months). All of their patients had a positive response; however, none were tapered from their intranasal corticosteroid use.

In their 8-year retrospective review, Schubert and Goetz[25] demonstrated a positive effect with 2 months of postoperative low-dose oral corticosteroid use and an even greater benefit in patients taking oral corticosteroids for 1 year. Recently, to reduce the need for maintenance corticosteroid therapy and minimize disease recidivism, postoperative immunotherapy has been advocated. Mabry and colleagues[21,30–33] have presented encouraging results with immunotherapy directed against relevant fungal and antifungal antigens to which the patient has demonstrated an allergy. In their protocol, oral corticosteroids are given for approximately 1 month and topical nasal corticosteroids are used for approximately 8 weeks. Approximately 6 to 8 weeks after surgery, immunotherapy is initiated and continued empirically for at least 3 years.

Allergic fungal sinusitis is an increasingly recognized form of chronic rhinosinusitis. Ophthalmologists provide an important role in the diagnosis, treatment, and follow-up of patients with AFS; therefore, it is essential for them to be aware of the highly characteristic clinical, radiologic, and histopathologic features of AFS. Clinical investigators in the area of orbital disease are encouraged to share their experiences in the management of patients with AFS.

Stephen R. Klapper, M.D.
Indianapolis, Indiana, U.S.A.

James R. Patrinely, M.D.
Houston, Texas
Pensacola, Florida

REFERENCES

1. Chang, WJ, Tse DT, Bressler KL, et al. Diagnosis and management of allergic fungal sinusitis with orbital involvement. *Ophthal Plast Reconstr Surg* 2000;16:72–4.
2. Ence BK, Gourley DS, Jorgensen NL, et al. Allergic fungal sinusitis. *Am J Rhinol* 1990;4:169–78.
3. Cody DT II, Neel HB III, Ferreiro JA, Roberts GD. Allergic fungal sinusitis: the Mayo Clinic experience. *Laryngoscope* 1994;104:1074–9.
4. Marple BF, Gibbs SR, Newcomer MT, Mabry RL. Allergic fungal sinusitis-induced visual loss. *Am J Rhinol* 1999;13:191–5.
5. de Juan E, Green WR, Iliff NT. Allergic periorbital mucopyocele in children. *Am J Ophthalmol* 1983;96:299–303.
6. Dunlop IS, Billson FA. Visual failure in allergic Aspergillus sinusitis: case report. *Br J Ophthalmol* 1988;72:127–30.
7. Jay WM, Bradsher RW, LeMay B, et al. Ocular involvement in mycotic sinusitis caused by Bipolaris, *Am J Ophthalmol* 1988;105:366–70.

8. Jacobson M, Galetta SL, Atlas SW, et al. Bipolaris-induced orbital cellulitis. *J Clin Neuroophthalmol* 1992;12:250–6.
9. Heier JS, Gardner TA, Hawes MJ, et al. Proptosis as the initial presentation of fungal sinusitis in immunocompetent patients. *Ophthalmology* 1995;102:713–7.
10. Chang WJ, Shields CL, Shields JA, et al. Bilateral orbital involvement with massive allergic fungal sinusitis. *Arch Ophthalmol* 1996;114:767–8.
11. Klapper SR, Lee AM, Patrinely JR, et al. Orbital involvement in allergic fungal sinusitis. *Ophthalmology* 1997;104: 2094–100.
12. Carter KD, Graham SM, Carpenter KM. Ophthalmic manifestations of allergic fungal sinusitis. *Am J Ophthalmol* 1999;127:189–95.
13. Pratt MF, Burnett JR. Fulminant Drechslera sinusitis in an immunocompetent host. *Laryngoscope* 1988;98:1343–7.
14. Washburn RG, Kennedy DW, Begley MG, et al. Chronic fungal sinusitis in apparently normal hosts. *Medicine* 1988;67:231–47.
15. Killingsworth SM, Wetmore SJ. Curvularia/Drechslera sinusitis. *Laryngoscope* 1990;100:935–7.
16. Rifai M, Kenawi B. Visual dysfunction: abnormal sign of sphenoidal lesions. *J Laryngol Otol* 1990;104:217–21.
17. Manning SC, Schaefer SD, Close LG, Vuitch F. Culture-positive allergic fungal sinusitis. *Arch Otolaryngol Head Neck Surg* 1991;117:174–8.
18. Brown P, Demaerel P, McNaught A, et al. Neuro-ophthalmological presentation of non-invasive Aspergillus sinus disease in the non-immunocompromised host. *J Neurol Neurosurg Psychiatry* 1994;57:234–7.
19. Corey JP, Delsupehe KG, Ferguson BJ. Allergic fungal sinusitis: allergic, infectious, or both? *Otolaryngol Head Neck Surg* 1995;113:110–9.
20. Manning SC, Vuitch F, Weinberg AG, Brown OE. Allergic aspergillosis: a newly recognized form of sinusitis in the pediatric population. *Laryngoscope* 1989;99:681–5.
21. Marple BF, Mabry RL. Comprehensive management of allergic fungal sinusitis. *Am J Rhinol* 1998;12:263–8.
22. Manning SC, Holman M. Further evidence for allergic pathophysiology in allergic fungal sinusitis. *Laryngoscope* 1998;108:1485–96.
23. Bent JP III, Kuhn FA. Diagnosis of allergic fungal sinusitis. *Otolaryngol Head Neck Surg* 1994;111:580–7.
24. deShazo RD, Swain RE. Diagnostic criteria for allergic fungal sinusitis. *J Allergy Clin Immunol* 1995;96:24–35.
25. Schubert MS, Goetz DW. Evaluation and treatment of allergic fungal sinusitis. I. Demographics and diagnosis. *J Allergy Clin Immunol* 1998;102:387–94.
26. Schubert MS, Goetz DW. Evaluation and treatment of allergic fungal sinusitis. II. Treatment and follow-up. *J Allergy Clin Immunol* 1998;102:395–402.
27. Ponikau JU, Sherris DA, Kern EB, et al. The diagnosis and incidence of allergic fungal sinusitis. *Mayo Clin Proc* 1999;74:877–84.
28. Dibbern DA Jr, Dreskin SC. Allergic fungal sinusitis [letter]. *Mayo Clin Proc* 2000;75:122.
29. Manning SC, Merkel M, Kriesel K, et al. Computed tomography and magnetic resonance diagnosis of allergic fungal sinusitis. *Laryngoscope* 1997;107:170–6.
30. Mabry RL, Manning SC, Mabry CS. Immunotherapy in the treatment of allergic fungal sinusitis. *Otolaryngol Head Neck Surg* 1997;116:31–5.
31. Folker RJ, Marple BF, Mabry RL, Marbry CS. Treatment of allergic fungal sinusitis: a comparison trial of postoperative immunotherapy with specific fungal antigens. *Laryngoscope* 1998;108:1623–7.
32. Mabry CS, Marple BF, Folker RJ. Immunotherapy for allergic fungal sinusitis: three years' experience. *Otolaryngol Head Neck Surg* 1998;119:648–51.
33. Mabry RL, Marple BF, Mabry CS. Outcomes after discontinuing immunotherapy for allergic fungal sinusitis. *Otolaryngol Head Neck Surg* 2000;122:104–6.

Reply to Drs. S.R. Klapper and J.R. Patrinely's Letter on "Orbital Involvement in Allergic Fungal Sinusitis"

To the Editor:

The letter regarding our three cases of allergic fungal sinusitis raised the issues of the limited description of the typical presentation of allergic fungal sinusitis and the limited number of citations. This manuscript was initially submitted in August 1997 to *Ophthalmic Plastic and Reconstructive Surgery,* before the publication of their article in December 1997. Originally, our manuscript was more comprehensive in both the description of allergic fungal sinusitis and thus the number of references. The previous editor suggested that the article be significantly reduced to the length of a "case report" because of a pending change in journal format. The final revision, resubmitted in October 1997, does contain a limited description of allergic fungal sinusitis and a reduced number of references. In addition, greater than one third of the articles mentioned in the letter were not published at the time that our manuscript was submitted. After a formal acceptance by the previous editor, there was a delay in publication during the transition period between the change in journal editors. The misplaced manuscript was rediscovered in 1999 by the current editor, who subsequently published this article after a re-review.

Warren J. Chang, M.D.,
David T. Tse, M.D.
Miami, Florida, U.S.A.

Digital Photography for the Ophthalmic Plastic Surgeon

To the Editor:

Digital technology increasingly permeates our lives, yet it is unclear how it impacts our practices. In our ophthalmic plastic surgical practices, we successfully use digital photography for reasons of convenience and cost.

Traditional clinical photography using slides or Polaroid prints requires significant material costs including film and processing, as well as labor costs for labeling, sorting, and filing of photographs into patient records. Slide film has significant expense, such as developing, labeling, and filing; in addition, there may be a significant delay for the slides to be processed. Slides also require a print to be made for insurance purposes. Polaroid photographs, which cost nearly $1.00 each, are small, relatively blurred, and difficult duplicate.

In contrast, digital photography stores a photographic image on magnetic or optical media and offers significant advantages over conventional external photography. These include 1) rapid verification of image adequacy, 2) significant savings of time and cost, and 3) the ability to instantly review a patient's image on a TV monitor during the examination to illustrate specific clinical findings.

Conversion to digital photography has been reported by plastic surgeons,[1–3] pathologists,[4] ophthalmologists for retinal photography,[5] and in various other medical and surgical specialties. However, minimal information exists about the practice of digital photography among ophthalmic plastic surgeons. To determine the penetration of digital photography among ophthalmic plastic surgeons and the perceived obstacles to switching to a digital practice, we faxed a one-page survey to 400 ophthalmic plastic surgeons to query their current photography methods. One hundred thirty-eight (35%) surveys were returned.

Nearly 40% of practices currently use digital photography to some degree, and 16% use it exclusively. The most commonly cited reasons for not having a digital practice, in decreasing order of frequency, were 1) concern about suboptimal picture quality, 2) the need to train additional personnel, and 3) skepticism about cost savings.

Of respondents, 90% have a computer and 80% already own an adequate printer to support a practice of digital photography. Of these, 90% are IBM compatible and 10% are Macintosh.

The average cost of a digital camera system at the time of this survey was approximately $1,100, whereas a conventional camera system costs approximately $1,200. Practices using conventional photography spend more than $2,000 for supplies annually; moreover, slightly more than 40% of these practices have a dedicated technician for labeling and filing these photographs. Digital photography practices, in contrast, spend an average of only $100 per year printing photographs, and depending on the system used, may not require any additional time or staff to "file" or organize the digital images.

Most respondents (89%) believed that a payback within 2 years would be reasonable to justify switching to digital photography. Although the average cost of a digital camera system among respondents was $1,100, we believe that an excellent digital camera can be purchased for less than $800. Thus, the "payback" period for digital photography is less than 1 year for most practices. Olympus, Kodak, and Nikon digital cameras account for more than 90% of cameras used in digital practice.

Because most insurance companies require photographs before approval or paying claims, the costs associated with such submissions can be considerable. Our survey determined that 51% of practices submit Polaroid photographs for insurance purposes. On average, practices report that they must resubmit insurance photographs four times each month because of the insurance company's loss of their photograph. The cost of high-quality color inkjet photographs approaches the cost of a Polaroid ($1.00 per print), whereas black and white laser prints (which our insurance carriers accept), made from digital photographs, cost less than a nickel.

Finances aside, satisfaction with a photography system is critical for the practice to continue its use. Ninety-two percent of digital photography practices reported that they are either "very satisfied" or "completely satisfied" compared with 58% of practices using conventional photography (Fig. 1).

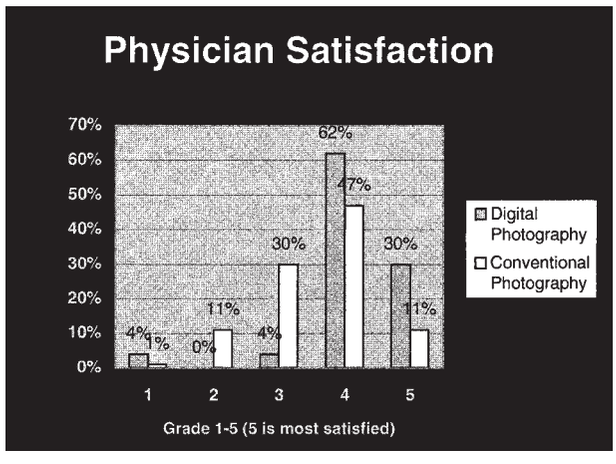

FIG. 1. Ninety-two percent of digital photography practices reported that they were either "very satisfied" or "completely satisfied."

Digital photography is becoming the method of choice for both nonmedical and medical purposes.[1–5] It offers several advantages over conventional photography, not the least of which is the ability to expeditiously reprint a photograph at minimal expense. Indeed, there is no cost for a "bad picture" because it is never printed. Moreover, the ability to archive captured images on inexpensive ($1.00) CD ROMs, apply key words, and share images via electronic communication are benefits unique to digital photography. Despite some respondents' concerns to the contrary, image quality of a 2.1 mega-pixel camera allows excellent reproduction of photographs up to 8 × 10 inches (Fig. 2). Indeed, a 2.1 mega-pixel camera provides all the necessary resolution for 1) insurance submission purposes, 2) PowerPoint presentations, and 3) publication.[1–3] Digital photography can be used with photo database programs, which allow the application of multiple key words to a single photograph. This facilitates the rapid retrieval of all photographs that meet specific criterion, such as "pre-op" and "congenital ptosis."

In conclusion, most practices already own the requisite computing power to deploy digital photography. Conversion from a conventional photographic practice using Polaroid film or slides will often pay for itself in the first year of use, and offer several advantages not available at any cost. Of note, practices need to verify with their insurance carrier that a black and white laser photograph will be accepted as a photographic documentation.

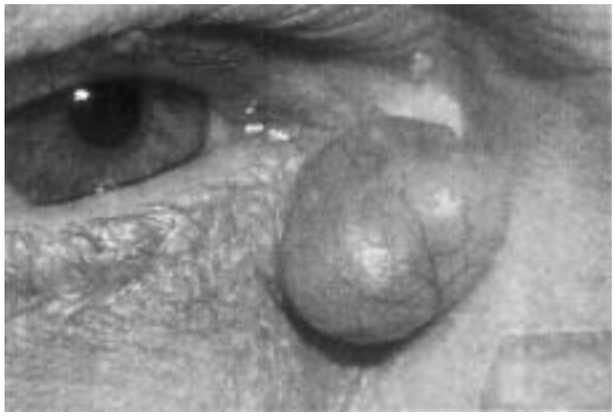

FIG. 2. This photograph from a 2.1 mega-pixel camera, printed on a simple black and white laser printer, demonstrates the superb quality and detail that digital photography affords. Date and time may be "stamped" on the print.

Mark S. Brown, M.D.
Vinod Jindal, M.D.
Peter A. D. Rubin, M.D.

REFERENCES

1. DiSaia JP, Ptak JJ, Achauer BM. Digital photography for the plastic surgeon. *Plast Reconstr Surg* 1998:569–73.
2. Sankar TK, Khan MS. Digital photography for the plastic surgeon, *Plast Reconstr Surg* 2000:2636.
3. Edsorm LE. Conversion to digital photography and photo archiving. *Plast Reconstr Surg* 2000:1576–7.
4. Furness PN. The use of digital imaging in pathology. *J Pathol* 1997:253–63.
5. Liesenfeld B, Kohner E, Piehlmeier W, et al. A telemedical approach to the screening of diabetic retinopathy: digital fundus photography. *Diabetes Care* 2000:345–8.

More Information on Alloderm

To the Editor:

Two important points have been brought to our attention regarding our recently published report.[1] We would like to present two important omissions from the article.

First, examining Alloderm (LifeCell Corp., The Woodlands, TX, U.S.A.) (directly out of the package) with a dissecting microscope, after the Alloderm has been soaked in saline and is ready for implantation, occasionally reveals the presence of multiple fine hair segments (less than 1 mm long). These are presumably remnants of the donor skin hair that has been shaved before Alloderm processing using enzymatic digestion.

Second, the presence of enzymatically treated human hair and the light microscopic findings of a foreign body granuloma to this hair seen in Figure 3 of our article[1] suggest that the material may elicit a subclinical inflammatory response.

We found no complication attributable to this material in 63 consecutive cases;[1] previous reports describe the use of this material in eyelid, gingival, and nasal septal reconstruction, lip augmentation, and integumental reconstruction.[2–6] To our knowledge, none of these reports describes clinical granulomata or foreign body reaction.

We believe this information could have implications regarding the use of this procedure, and we regret that we did not include it in our original article.

We have contacted the LifeCell Company, which manufactures Alloderm, and have discussed the subject of small particles of hair on Alloderm. They

are well aware of the subject and make the following four points:

1. Hair is an integral part of human skin.
2. Alloderm is processed to ensure that the hair follicle is decellularized and nonviable.
3. LifeCell has a quality-control procedure to exclude significant hair presence.
4. Preclinical studies performed by the company demonstrate that in vivo reaction to hair, if present within Alloderm, is less than or equivalent to the reaction to conventionally used absorbable suture material.

REFERENCES

1. Shorr NS, Perry JD, Goldberg RA, et al. The safety and applications of acellular human dermal allograft in ophthalmic plastic and reconstructive surgery: a preliminary report. *Ophthal Plast Reconstr Surg* 2000;16:223–7.
2. Wainwright DJ. Clinical evaluation of an acellular allograft dermal matrix in full-thickness burns. *J Burn Care Rehabil* 1996;17:124–36.
3. Shulman J. Clinical evaluation of an acellular dermal allograft for increasing the zone of attached gingiva. *Practical Periodont Aesthetic Dent* 1996;8:201–8.
4. Jones FR, Schwartz BM, Silverstein P. Use of a nonimmunogenic acellular dermal allograft for soft tissue augmentation. *Aesthetic Surg Q* 1996;16:196–201.
5. Kridek RWH, Foda H, Lunke KC. Septal perforation repair with acellular human dermal allograft. *Arch Otolaryngol Head Neck Surg* 1998;124:73–8.
6. Tobin HA, Karas ND. Lip augmentation using an alloderm graft. *J Oral Maxillofac Surg* 1998;56:722–7.

Norman Shorr, M.D.
Robert A. Goldberg, M.D.
Jonathan Hoenig, M.D.
Jules Stein Eye Institute
University of California at Los Angeles
Los Angeles, California, U.S.A.

Julian D. Perry, M.D.
Cleveland Clinic Foundation
Cleveland, Ohio, U.S.A.

Jack K. Shorr, B.A.
Keck School of Medicine
University of Southern California
Los Angeles, California, U.S.A.