ORIGINAL CONTRIBUTION

Rhinology, 47, 385-388, 2009

Is canine fossa access necessary for successful maxillary fungus ball treatment?*

Fabio Pagella[1], Elina Matti[1], Georgios Giourgos[1], Andrea Colombo[1], Francesca De Bernardi[2], Paolo Castelnuovo[2]

[1] Department of Otorhinolaryngology, University of Pavia, Foundation IRCCS Policlinico S. Matteo, Pavia, Italy
[2] Department of Otorhinolaryngology, University of Insubria, Ospedale di Circolo e Fondazione Macchi, Varese, Italy

SUMMARY

Background: *Sinus fungus ball (FB) is a non-invasive mycosis that affects immunocompetent hosts, most frequently localized in the maxillary sinus. The current golden standard treatment is surgical removal.*

Objective: *To evaluate the effectiveness of an endonasal endoscopically assisted approach to remove a maxillary FB combined or not with a transoral approach (sinusoscopy via canine fossa).*

Methods: *A retrospective evaluation of paranasal FB treated by functional endoscopic sinus surgery (FESS) + transoral approach, compared to those treated by a sole FESS procedure.*

Results: *In total, 65 out of 90 patients presented with a maxillary localization and were treated by FESS. Thirthy-three patients received a combined FESS + transoral approach and 32 received solely a FESS procedure. Antimycotic medical therapy was not used in any case. With a mean follow-up of 93 months, the treatment was successful in 62 patients (95,4%) without significant differences between the two groups.*

Conclusions: *Our data confirm the efficacy of FESS in the treatment of maxillary FB. A similarity in long-term results in both groups demonstrated that transoral sinusoscopy can be avoided. With the assistance of lateral-view and flexible endoscopes, angled surgical equipment and maxillary saline solution irrigations, complete removal of the diseased material and sinus clearance can be achieved by a sole middle meatotomy, reducing both morbidity and operating time.*

Key words: fungus ball, mycosis, maxillary sinus, functional endoscopic sinus surgery, canine fossa

INTRODUCTION

Paranasal sinus fungus ball (FB) is a non-invasive mycosis that affects immunocompetent hosts and usually afflicts one single sinus [1-4]. The disease is mainly caused by *Aspergillus* species, is most frequently localized in the maxillary sinus and it manifests principally during the fourth and fifth decade of life with a female predominance [2,5-10]. Clinical signs and symptoms are aspecific and frequently they mimic those of a chronic bacterial rhinosinusitis [5,7]. Endoscopic examination of the nasal cavities usually reveals a blocked ostiomeatal complex with a purulent discharge in the middle meatus [2-5,7].

Sinonasal CT examination is a crucial diagnostic investigation tool of FB lesions. Usually, a heterogeneous opacity of the affected sinus is observed, along with metal-like hyper density areas or micro calcifications. Moreover, a CT scan sometimes shows a bony erosion of the medial maxillary sinus wall. Magnetic resonance investigation (MRI) results useful in some selected cases, as in T2 sequences it often demonstrates a signal void area in correspondence of the diseased tissue [2,7,11-13]. DeShazo [8], back in 1997, was the first to declare some clinico-pathological criteria necessary to formulate a proper diagnosis of a paranasal FB (Table 1). The correct identification of a non-invasive mycosis is important for the start of an appropriate therapy. A definitive diagnosis can be demonstrated histopathologically by the absence of mucosal fungal invasion. In cases of maxillary FB, the elective therapy is surgical with an excellent prognosis [1,3,4,7,14-16].

The aim of this paper is to report our experience in the endoscopic treatment of maxillary FB and evaluate the effectiveness of the combined endonasal (endoscopically-assisted) and transoral (via canine fossa) approach.

*Received for publication: December 17, 2008; accepted: April 4, 2009

DOI:10.4193/Rhin08.234

Table 1. deShazo's et al. [8] clinicopathologic criteria for diagnosis of fungus ball.

1.	Radiologic evidence of sinus opacification with or without associated flocculent calcifications.
2.	Mucopurulent, cheesy or clay-like material within a sinus.
3.	A matted, dense conglomeration of hyphae separate from but adjacent to sinus respiratory mucosa.
4.	A chronic inflammatory response of variable intensity in the mucosa adjacent to fungal elements. This response includes lymphocytes, plasma cells, mat cells and eosinophils without an eosinophil predominance or a granuloma response. Allergic mucine is absent on hematoxylin-eosin stained material.
5.	No histologic evidence of fungal invasion of mucosa, associated blood vessels, or underlying bone visualized microscopically on Gomori methenamine silver or other special stains for fungus.

MATERIALS AND METHODS

Retrospective study

After a data review of the patients subjected to sinonasal endoscopic surgery in the ENT Department of Pavia's University Hospital, Policlinico S. Matteo, between January 1994 and December 2006, we have evidenced 65 cases of maxillary FB that fulfilled deShazo's diagnostic criteria (Table 1) [8]. We reviewed patient's medical history, symptoms, clinical examinations (full head and neck, nasal endoscopy), radiological examinations (CT/MRI), and surgery's descriptions and video. Finally, microbiological and histopathological specimens were analysed. Patients were divided into 2 groups: those treated (1994-2002) with functional endoscopic sinus surgery (FESS) and a transoral (sinusoscopy via canine fossa) approach (group A) and patients treated (2002-2006) using solely the FESS procedure (group B). For both groups follow-up and long term results have been registered and analyzed.

RESULTS

The cohort (65 individuals) consisted of 22 males (33,87%) and 43 females (66,13%), with an age range between 19 and 89 (mean 48,8 years). The predominant patient's symptom was facial pain (60%), followed by nasal respiratory obstruction (49,2%), rhinorrhea (47,6%) and cacosmia (15,3%). All patients were immunocompetent and 53 of them (81,5%) have been subjected to endodontic surgery in the past. Diagnostic nasal endoscopy revealed a blocked ostiomeatal complex with purulent discharge in the middle meatus, in all cases. For all patients a sinonasal CT was obtained and in 6 of them (9,2%), also, an MRI. Magnetic resonance was performed in selected cases, when a differential diagnosis with a neoplastic lesion was requested. In particular, computer tomography revealed interruption of the medial maxillary wall in 21 patients (32,3%), meanwhile MRI evidenced presence of a signal void area in 100% of the cases.

All patients were subjected to FESS. Specifically, 33 patients (group A) received a FESS in combnation with a transoral (sinusoscopy via canine fossa) procedure, 32 patients instead (group B) had solely a FESS approach. Surgery has always been performed under general anaesthesia, with the patient placed in a slightly reversed Trendelemburg position. Cotonoid pledges, soaked in xylometazoline hydrochloride 0.1% solution, were positioned in the nasal cavity and left in place for 10 minutes. One percent lidocaine with 1:200.000 epinephrine was subsequently injected at the level of the root of the middle turbinate and of the uncinate process. In all patients, an uncinectomy and an ample middle meatal antrostomy with a partial resection of the posterior fontanelle area was performed. In group A patients, treated with the combined approach, the tip of the sinus trocar was positioned superiorly and laterally to the root of the upper canine tooth (canine fossa) and with a slight pressure and torsional tip's movement, penetration in the maxillary sinus was achieved. Through the trocar's metallic sheath various endoscopes (0°, 45° and 70°), so as to visualize every possible recess of the sinus, along with suction tubes and forceps for the removal of the mycotic material were inserted. The mucosal incision in the oral vestibule has not required suturing in any of our cases. For a complete antrum clearance, in both groups, we've practiced several maxillary irrigations with normal saline solution. In group B patients, at the end of the procedure we performed a final control of the sinus through a transnasal insertion of a flexible scope. None of our patients received antifungal medical therapy, neither local or systemic, even when evidence of maxillary bone erosion was present.

Fungi species were isolated in 19/65 cases (29,2%), with *Aspergillus fumigatus* being the most frequent (84,2%). Histological examination of the removed material evidenced presence of fungal life in 100% of the cases; moreover, mucosal biopsies examination did not reveal host's tissue invasion.

Figure 1. Endoscopic view of the right nasal fossa through a 70° angled endoscope: removal of micotic material by angled suction through wide middle antrostomy.

Follow-up varied from 24 to 173 months, with a median of 93 months. In particular, the group A mean follow-up was 120 months, whereas that in group B was 66 months. Considering the entire cohort (65 individuals), 62 patients (95,4%) have been successfully treated, while 3 of them (4,6%) had a revision surgery within the first year. In the last mentioned cases, the cause of failure was stenosis of the middle meatal antrostomy, which probably can be ascribed to its insufficient enlargement during the primary operation. In all 3 cases, the sinus patency has been restored as the ostium was enlarged with an endoscopic technique. Two of the revisioned cases belonged to group A (6%) and 1 to group B (3%). Thus far, all patients are symptomless and free of disease.

DISCUSSION

Paranasal sinus FB is a non-invasive form of mycosis and its most frequent localization is the maxillary sinus. All authors agreed that surgical treatment represents its elective therapy; moreover, no medical therapy is curative [1-8,17]. However, in the literature descriptions exist of several surgical procedures: from traditional techniques as Caldwell-Luc's (CL) to modern FESS [1-4,12,15,18-22]. Recent publications reveal that external approach techniques like lateral rhinotomy or Lynch's incisions, even if infrequently performed, are still in use [23-25].
During the CL procedure, the surgeon performs a large intraoral opening of the maxillary sinus through the canine fossa, combined with an inferior meatal antrostomy and successively he removes the diseased sinus mucosa entirely. This technique does not interfere with the natural ostium of the maxillary sinus that, conversely, seems to possess a critical role in the pathogenesis of a fungus ball.

Thus far, FESS procedures represent the gold standard surgical treatment in many sinonasal inflammatory diseases. In the particular case of paranasal FB, the surgical procedure consists in an uncinectomy and an ample middle meatotomy, followed by the complete removal of the sinus diseased content using curved suction tubes under angled view endoscopes (45° and 70°), with or without a canine fossa sinusoscopy. Throughout the sinusoscopy's trocar we can access an entire sinus view and apply suction tubes and irrigators to remove the diseased tissue.
In the literature, however, sinusoscopy through the canine fossa is still an argument of debate. Jiménez Chobillon and Jankowski [26] sustain that such transoral procedure carries multiple advantages over other approaches (i.e. optimal visualization of the maxillary sinus, feasibility under local anesthesia, preservation of the normal sinus anatomy and physiology, possibility for odontogenic sinus foreign bodies extraction) and, moreover, in some selected cases they propose such sinusoscopy procedure even without a contemporaneous endonasal approach. According to Feng et al. [27] the combined, endonasal and transoral, approach is more efficacious than the pure endonasal operation. However, Costa et al. [28] in a recent literature review on surgical FB treatment, supported the idea that sinusoscopy via canine fossa should be advocated in some selected cases, in which complete extraction of the intrasinusal mycotic material through the medial antrostomy becomes elusive.

Until 2002, we had performed 33 FESS + sinusoscopy operations via canine fossa procedures (group A) and subsequently, 32 pure FESS procedures without such a transoral approach (group B). In all group B patients we accomplished a complete clearance of the maxillary sinus, performing just an endonasal approach. Using straight view (0°) and angled (45°) 4 mm optic fibres, we've performed an uncinectomy followed by an ample middle meatotomy and a partial removal of the posterior fontanelle area. The 45° and then, 70° scope allowed us to assess the diseased maxillary sinus, and equipped with angled surgical instruments and curved saline solution irrigators, we managed to completely remove the fungal material through, just, the middle meatotomy. However, as long as maxillary areas out of the visual control even with angled scopes may exist, we assessed the antrum endonasally with a flexible endoscope, so as, to assure an overall sinus clearance [29]. Long-term results in both groups have been quite similar (2 revisioned cases in group A and 1 in group B). In all 3 revisioned cases, the sinus ostium appeared stenotic within 1 year after the primary operation, most probably caused by a small-sized antrostomy or just a wide postsurgical scarring. Again, an endoscopic technique was implicated for the revision surgery and stenosis was succesfully treated by an enlargement of the maxillary ostium.

The sole surgical treatment of FB exhibits promising results with a recurrence range of about 5%, in concordance with results in the current literature [3,7,15-18].

CONCLUSION

Our data confirm the efficacy of FESS (95,4% success) in the treatment of maxillary FB; moreover, they demonstrate that in the surgical treatment of such disease sinusoscopy via canine fossa can be avoided. With the assistance of lateral-view endoscopes, angled surgical equipment and maxillary saline solution irrigations, complete removal of the pathological material and sinus clearance can be achieved by the sole middle meatotomy. Avoidance of the transoral approach reduces both morbidity and operating time.

REFERENCES

1. deShazo RD, Chapin K, Swain RE. Fungal sinusitis. N Engl J Med 1997; 337: 254-259.
2. Ferguson BJ. Fungus ball of the paranasal sinuses. Otolaryngol Clin North Am 2000; 33: 389-398.
3. Dufour X, Kauffmann-Lacroix C, Ferrie JC, et al. Paranasal sinus fungus ball and surgery: a review of 175 cases. Rhinology 2005; 43: 34-39.

4. Lee KC. Clinical features of the paranasal sinus fungus ball. J Otolaryngol 2007; 36: 270-273.
5. Stammberger H, Jakse R, Beaufort F. Aspergillosis of the paranasal sinuses: X-ray diagnosis, histopathology and clinical aspects. Annal Otol Rhinol Laryngol 1984; 93: 251-256.
6. Vennewald I, Henker M, Klemm E, et al. Fungal colonization of the paranasal sinuses. Mycoses 1999; 42: 33-36.
7. Dufour X, Kauffmann-Lacroix C, Ferrie JC, et al. Paranasal sinus fungus ball: epidemiology, clinical features and diagnosis. A retrospective analysis of 173 cases from a single medical center in France, 1989-2002. Med Mycol 2006; 44: 61-67.
8. deShazo RD, O'Brien M, Chapin K, et al. Criteria for the diagnosis of sinus mycetoma. J Allergy Clin Immunol 1997; 99: 475-485.
9. Mensi M, Salgarello S, Pinsi G, et al. Mycetoma of the maxillary sinus: endodontic and microbiological correlations. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2004; 98: 119-123.
10. Mensi M, Piccioni M, Marsili F, et al. Risk of maxillary fungus ball in patients with endodontic treatment on maxillary teeth: a case-control study. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2007; 103: 433-436.
11. Lund VJ, Lloyd G, Savy L, et al. Radiology in focus. Fungal rhinosinusitis. J Laryngol Otol 2000; 114: 76-80.
12. Dhong HJ, Jung JY, Park JH. Diagnostic accuracy in sinus fungus balls: CT scan and operative findings. Am J Rhinol 2000; 14: 227-231.
13. Yoon JH, Na DG, Byun HS, et al. Calcification in chronic maxillary sinusitis: comparison of CT findings with Histopathologic results. Am J Neuroradiol 1999; 20: 571-574.
14. Castelnuovo P, Gera R, Di Giulio G, et al. Paranasal sinus mycoses. Acta Otorhinolaryngol Ital 2000; 20: 6-15.
15. Klossek JM, Serrano E, Péloquin L, el al. Functional endoscopic sinus surgery and 109 mycetomas of paranasal sinuses. Laryngoscope 1997; 107: 112-117.
16. Pagella F, Matti E, De Bernardi F, et al. Paranasal sinus fungus ball: diagnosis and management. Mycoses 2007; 50: 451-456.
17. Grosjean P, Weber R. Fungus balls of the paranasal sinuses: a review. Eur Arch Otorhinolaryngol 2007; 264: 461-470.
18. Stammberger H. Endoscopic surgery for mycotic and chronic recurring sinusitis. Ann Otol Rhinol Laryngol 1985; 94: 1-11.
19. De Freitas J, Lucente FE. The Caldwell Luc procedure. Institutional review of 670 cases, 1975-1985. Laryngoscope 1988; 98: 1297-1300.
20. Ferreiro JA, Carlson BA, Cody DT III. Paranasal sinus fungus balls. Head Neck 1997; 19: 481-486.
21. Chao TK, Liu CM. Gauze-assisted technique in endoscopic removal of fungus balls of the maxillary sinus. Am J Rhinol 2006; 20: 417-420.
22. Costa F, Polini F, Zerman N, et al. Functional endoscopic sinus surgery for the treatment of Aspergillus mycetomas of the maxillary sinus. Minerva Stomatol 2008; 57: 117-125.
23. Panda NK, Sharma SC, Chakrabarti A, et al. Paranasal sinus mycoses in north India. Mycoses 1998; 41: 281-286.
24. Panda NK, Balaji P, Chakrabarti A, et al. Paranasal sinus aspergillosis: its categorization to develop a treatment protocol. Mycoses 2004; 47: 277-283.
25. Chakrabarti A, Sharma SC. Paranasal sinus mycoses. Indian J Chest Dis Allied Sci. 2000; 42: 293-304.
26. Jiménez Chobillon MA, Jankowski R. What are the advantages of the endoscopic canine fossa approach in treating maxillary sinus aspergillomas? Rhinology 2004; 42: 230-235.
27. Feng LR, Tan CQ, Guo QM. Treatment of noninvasive aspergillosis of maxillary sinus by functional endoscopic sinus surgery. Lin Chuang Er Bi Yan Hou Ke Za Zhi 2000; 14: 554-555.
28. Costa F, Polini F, Zerman N, et al. Surgical treatment of Aspergillus mycetomas of the maxillary sinus: Review of the literature. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2007; 103: 23-29.
29. Hosemann W, Scotti O, Bentzien S. Evaluation of telescopes and forceps for endoscopic transnasal surgery on the maxillary sinus. Am J Rhinol 2003; 17: 311-316.

Fabio Pagella, MD
Foundation IRCCS Policlinico San Matteo
viale Golgi n°19
27100 Pavia
Italy

Tel: +39-38-250-3350
Fax: +39-38-252 8184
E-mail: tpagella@libero.it