The treatment of sinusitis following maxillary sinus grafting with the association of functional endoscopic sinus surgery (FESS) and an intra-oral approach

Key words: bone regeneration, bone substitutes, functional endoscopic sinus surgery, guided tissue regeneration, sinus floor elevation, sinusitis, surgical techniques

Abstract

Aim of the study: To present the results of a prospective study on the management of infectious complications following maxillary sinus floor elevation procedures with a combined endoscopic (FESS) and intra-oral approach.

Materials and methods: From 2005 to 2009, twenty consecutive patients were diagnosed for sinusal chronic infectious complications refractory to medical treatment following maxillary sinus floor elevation and grafting procedures. All patients were treated with a combination of functional endoscopic sinus surgery (FESS) through a transnasal approach and an intra-oral approach, performed by an ear, nose, and throat team and an oral and maxillofacial team, respectively, in the same surgical session under general anesthesia.

Results: In 16 of 20 patients, the 4-week endoscopic control demonstrated a complete clinical healing and recovery of the normal sinus ventilation and drainage. In two patients, the persisting sinusitis at the 4-week control was successfully treated (8th week) with an antibiotic therapy based on the antibiogram carried out on the bacterial culture obtained by the aspiration of the sinusal content. In one patient, the persisting sinusitis (3 months after surgery) was successfully treated with the aspiration of the infectious material from the maxillary sinus. In one patient, finally, it was necessary to perform a second combined surgical treatment to treat the persisting sinusitis.

Discussion and conclusions: In this study, a relevant number of cases of chronic infectious complications following sinus floor elevation procedures are presented. To the authors’ knowledge, it is the first time that well-defined treatment protocols based on a combined endoscopic (FESS) and intra-oral surgical approach are proposed. The positive, albeit preliminary, results obtained in this study seem to validate this treatment modality.

The rehabilitation of partially or totally edentulous patients with implant-supported prostheses has become common practice in the last decades, with reliable long-term results (Albrektsson et al. 1986; Lindquist et al. 1996; Buser et al. 1997; Arvidson et al. 1998; Lekholm et al. 1999; Weber et al. 2000; Leonhardt et al. 2002).

However, local conditions of the edentulous alveolar ridges may be unfavorable for implant placement. In particular, the posterior edentulous maxilla has frequently presented a challenge for the oral surgeon because of the lack of bone, due to alveolar ridge resorption and maxillary sinus expansion. Moreover, the low quality of the residual bone can further reduce the long-term outcome of implants placed in this area.

For these reasons, maxillary sinus floor elevation and grafting via either a lateral or a crestal approach have become a very common procedure in recent years, with predictable results and a generally low post-operative complication rates (Chiapasco et al. 2006a, 2006b, 2009a, 2009b). Although rare, complications following sinus floor elevation and grafting may present, with a 3% incidence, as maxillary sinusitis and/or infection of the grafting material, occasionally associated with the formation of oro-antral communications in particular in cases of chronic sinus infection [range: 0–10%]. The main cause of
these complications is represented by the perforation of the Schneiderian membrane during the elevation of the sinus floor followed by the dislocation of the grafting material and/or dental implant into the sinusosal cavity and subsequent contamination of the material determining a foreign body reaction and infection (Chanavaz 1990; Timmenge et al. 1997, Raghoebar & Batenburg 1999, Chiapas-co et al. 2006a, 2006b; Katranji et al. 2008; Pjetursson et al. 2008; Chiapasco et al. 2009a, 2009b). However, it was demonstrated that part of these complications occurred in patients with a history of sinusitis or sinus clearance dysfunctions, due to diffuse antral mucosa hyperplasia, partial or total sinusosal ostium obstruction, or anatomic alterations in the nasal cavities (that may represent an obstacle to the sinusosal drainage through the natural ostium in the middle meatus) such as relevant septum deviation, relevant turbinate hyperplasia, and the presence of the conchobulosa (Timmenga et al. 1997; Sambataro et al. 2003; Schwartz-Arad et al. 2004, Pignat-aro et al. 2008; Mantovani 2009; Wallace 2010; Testori et al. 2011). Infection may be limited to the maxillary sinus treated with floor elevation and grafting, but it may also diffuse to other parasensal cavities and, in the most severe cases, involve the orbital cavity and the anterior and middle cranial fossae (Quiney et al. 1990, Timmenge et al. 2001; Alkan et al. 2008; Li & Wang 2008). Moreover, sinus infection may determine the formation of oro-antral communications with chronic suppuration often associated with the expulsion of grafting material particles from the fistula. It is therefore mandatory to treat these complications as soon as possible and following safe and reliable treatment protocols.

In case of sinus infection in conjunction with an oro-antral communication following a sinus floor elevation procedure, the traditional approach has been represented for many years by the sinusosal toleette with intra-oratal approach, with the aim of removing the infected grafting material from the sinusal cavity, in association with an inferior me-ntal antrostomy (Caldwell–Luc approach) and with the closure of oro-antral communications (if present) with local flaps (El-Hakim & el-Fakhary 1999, Katranji et al. 2008; Andric et al. 2010).

Nevertheless, due to the fact that in case of infectious complications following maxil-lary sinus floor elevation and grafting, (i) other parasensal cavities may be involved (ethmoid, frontal sinus, sphenoid sinus) that cannot be treated via and intra-oratal approach; (ii) a primary or secondary ostium obstruction determined by hyperplasia of the reactive mucosa is often present, sometimes associated with secondary medialization of the uncinate process that further hinders the sinusal ventilation and drainage; and (iii) predisposing conditions (septum deviation, con-cha bullosa, hypertrophic turbinate, etc.) may be present, the sinusal toleette with an intra-oratal approach in association with an inferior me-notal antrostomy may prove to be insufficient to obtain a complete recovery of the sinusosal functions.

It was indeed demonstrated that in case of maxillary sinusitis, the treatment of choice is nowadays represented by a transnasal endo-scopic approach, internationally known as FESS (Functional Endoscopic Sinus Surgery) (Schaef er et al. 1989, Stammberger 1989, Bus-aba & Kieff 2002). This approach, besides being definitely more conservative in comparision with the traditional Caldwell–Luc technique, demonstrated to be the only one that allows the correction of the ostium obstruction, the treatment of other parasensal sinuses involved in the infection, and of the previously cited predisposing anatomic factors.

On the other hand, the FESS approach alone may not be sufficient for the complete removal of the infected grafting material from the maxillary sinus (due to the impossibility of reaching every portion of the sinus with the available surgical instruments) and does not allow the closure of oro-antral communications, if present.

Therefore, the most appropriate approach for the treatment of maxillary sinusitis follow-ing sinus floor elevation and grafting might be a combination of FESS and intra-oratal surgery. While this type of combined approach has already been described for the removal of dental implants migrated into the maxillary sinus (Chiapasco et al. 2009a, 2009b), to the Authors’ knowledge, it has never been systema-tically proposed or described for the treatment of maxillary sinusitis subsequent to sinus floor elevation and grafting.

The aim of this study was therefore to present the Authors’ experience with this approach in the treatment of infectious complications following sinus grafting procedures on a sample of 20 consecutively treated patients.

Materials and methods

From January 2005 to December 2009, 20 patients (14 women and six men) with ages ranging from 34 to 65 years [mean: 49.2 years] who previously underwent (2–12 months before) sinus floor elevation and grafting with a lateral approach in dental private practices, were referred to our departments [1. Unit of Otolaryngology, Department of Medicine, Surgery, and Dentistry, San Paolo Hospital, University of Milan, Milan, Italy; 2. Unit of Oral Surgery, Department of Medicine, Surg-ery, and Dentistry, San Paolo Hospital, Uni-versity of Milan, Milan, Italy; 3. Unit of Maxillofacial Surgery, Istituto Stomatologico Italiano, Milan, Italy]. The three centers cooper-ate since 2005 and all patients were exam-ined by a joint team of maxillofacial and ENT surgeons.

All patients reported that, days after undergo-ing a sinus grafting procedure (range: 3–12 weeks after), one or more of the following symptoms appeared: (i) pain and/or feeling of tension to the face; (ii) visible swelling of the cheek/paranasal area/inferior orbital area, sometimes associated with cutaneous reddening; (iii) chronic suppuration, sometimes associated with the expulsion of grafting material from the mouth and/or nose.

All patients presented one or more oro-antral fistulas, with the smallest ones being inspectable only with a surgical probe and the larger ones being clinically visible.

Seventeen of 20 patients had been treated with unilateral sinus lift (two of them, #2 and 13, in association with implant placement), while three had been treated with bilateral sinus lift. Antibiotic therapy was administered to all patients by their dentists (penicillins, penicillin in association with clavulanate, cephalosporins, macrolides) to treat the post-operative infection, but with only partial remission of signs and symptoms related to sinus infection.

Clinical evaluation of the patients at our units was associated with instrumental exam-i nation by means of: (i) panoramic radiograph; (ii) cranio-facial CT scan; (iii) nasal endoscopy (Karl Storz GmbH & Co. KG, Tuttinglen, Germany). When available, radiographic exam-i nations carried out prior to sinus floor eleva-tion were evaluated: these were often limited to periapical or panoramic radiographs. From these radiographs, it was impossible to clearly define the maxillary sinus situation before sinus grafting. In two patients, only CT scans of the maxilla obtained with a software dedi-cated to dental implant planning (Denta-scan or similar) were available, and showed no sign of pre-existing sinus floor pathology. Nonetheless, it was impossible to evaluate the entire maxillofacial complex, including the ostium of the maxillary sinus, the other para-nasal cavities and the nose.

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In 8 of 20 patients, nasal endoscopy and CT scans showed the presence of infection limited to the treated maxillary sinuses; in eight patients, infection involved also the ethmoidal cells, and in four patients, infection involved the maxillary sinuses, the ethmoidal cells, and the frontal sinus. None of the patients presented infection of the sphenoid sinus. In 7 of 20 patients, a variable amount of grafting material (particulated autogenous bone and alloplastic materials) was found inside the maxillary sinus cavity, both in contact with the sinus floor and sparse in different areas of the sinus [see Table 1].

All patients presented a total or sub-total clouding of the treated sinuses associated with obstruction of the ostium. In seven patients [#1, 2, 3, 7, 15, 19, 20], concomitant conditions that further determined the obstruction of the ostium, such as the concha bullosa, relevant septum deviation, and hypertrophy of the turbinates, were observed [see Table 1].

Due to the presence of: [i] sinusitis, often involving other paranasal cavities; [ii] ostium obstruction; and [iii] oro-antral fistulae, in all patients a transnasal endoscopic approach [FESS – Functional Endoscopic Sinus Surgery] performed by the ENT team associated with an intra-oral approach performed by the MF team were used in the same surgical session, under general anesthesia.

The FESS had not only the objective of eliminating infection in the involved paranasal cavities, and removing the infected grafting material from the maxillary sinus, but also that of widening the ostium and removing any obstacle to the correct sinus drainage and clearance.

The intra-oral approach had the objective of: [i] removing the grafting material not reachable with endoscopy [inferior portion and anterior recess of the maxillary sinus] or already consolidated on the sinus floor, [ii] closing the oro-antral communications by removing fistulae and performing a closure with local flaps. In some cases, endoscopy was used also from the intra-oral side to thoroughly check for residual granules of grafting material after transnasal procedures and intra-oral toilette were performed.

Antibiotic therapy [Ceftriaxone, 2 g at anesthesia induction, and 2 g/day in the following 7–10 days] was administered to all patients via intra-muscular injection.

In one patient (#7), who developed a bacterial infection associated with aspergillosis (fungus ball, as confirmed by laboratory analysis), this therapy was associated with oral administration of Levofloxacin [500 mg/day for 15 days].

**Endoscopic phase (FESS)**
The endoscopic phase always represented the first part of the surgical intervention, carried out in all cases under general anesthesia with oro-tracheal intubation. First, inferior uncinctomy was performed to expose the ostium, followed by a wide middle antrostomy that allowed for the removal of pus and infected grafting material dislocated inside the maxillary sinus. No attempt to entirely remove the sinus mucosa (differently from the traditional Caldwell–Luc technique) was carried out: only hypertrophic or polyoid tissue was removed, with the objective of reducing as much as possible bone exposure inside the sinus.

In cases in which maxillary sinus infection was associated with ethmoidal cells and/or frontal sinus infection, these latter were treated by a thorough endoscopic toilette.

In cases in which concomitant conditions such as the concha bullosa or middle turbinal hypertrophy were present [#1, 7, 15, 19, 20], these latter were treated in the same surgical session **via** endoscopic approach, to eliminate every possible obstacle to the functional recovery of the sinusal functionality.

**Intra-oral phase**
Once the FESS phase was completed, the intra-oral phase began without the placement of nasal packing, to permit a final control at the end of the surgical intervention.

A full thickness mucoperiosteal flap was elevated in the lateral-posterior maxilla to obtain the exposure of the antero-lateral wall of the maxillary sinus. The flap was designed

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**Table 1. Patients’ demographic and clinical data**

<table>
<thead>
<tr>
<th>Pts.</th>
<th>Sex</th>
<th>Age</th>
<th>First surgery</th>
<th>Complications</th>
<th>Associated factors</th>
<th>Date FESS + intra-oral</th>
<th>Complications – treatment of complications</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1</td>
<td>F</td>
<td>54</td>
<td>LSL</td>
<td>MSin + ESin</td>
<td>CB</td>
<td>2005</td>
<td>Sinusitis relapse due to perimplantitis – Second FESS + IO with complete healing in 4 weeks</td>
</tr>
<tr>
<td>#2</td>
<td>M</td>
<td>45</td>
<td>LSL + Im</td>
<td>MSin + ESin + AMM</td>
<td>SD</td>
<td>2006</td>
<td>Persisting sinusitis – transnasal aspiration with complete healing in 3 weeks</td>
</tr>
<tr>
<td>#3</td>
<td>M</td>
<td>55</td>
<td>RSL</td>
<td>MSin + ESin + AMM</td>
<td>SD</td>
<td>2006</td>
<td>Persisting sinusitis – antibiotic therapy with complete healing in 10 days</td>
</tr>
<tr>
<td>#4</td>
<td>F</td>
<td>51</td>
<td>RSL</td>
<td>MSin + ESin</td>
<td>No</td>
<td>2007</td>
<td>No</td>
</tr>
<tr>
<td>#5</td>
<td>F</td>
<td>34</td>
<td>RSL</td>
<td>MSin</td>
<td>No</td>
<td>2008</td>
<td>No</td>
</tr>
<tr>
<td>#6</td>
<td>F</td>
<td>55</td>
<td>LSL</td>
<td>MSin + ESin</td>
<td>No</td>
<td>2008</td>
<td>No</td>
</tr>
<tr>
<td>#7</td>
<td>F</td>
<td>57</td>
<td>LSL</td>
<td>MSin + FB</td>
<td>CB + TurbHyper</td>
<td>2008</td>
<td>No</td>
</tr>
<tr>
<td>#8</td>
<td>M</td>
<td>59</td>
<td>LSL</td>
<td>MSin + ESin + FSin</td>
<td>No</td>
<td>2008</td>
<td>Persisting sinusitis – antibiotic therapy with complete healing in 6 days</td>
</tr>
<tr>
<td>#9</td>
<td>M</td>
<td>41</td>
<td>LSL</td>
<td>MSin + ABM</td>
<td>No</td>
<td>2009</td>
<td>No</td>
</tr>
<tr>
<td>#10</td>
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<td>45</td>
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<td>MSin + ESin</td>
<td>No</td>
<td>2009</td>
<td>No</td>
</tr>
<tr>
<td>#11</td>
<td>F</td>
<td>47</td>
<td>LSL</td>
<td>MSin + ESin + FSin</td>
<td>No</td>
<td>2009</td>
<td>No</td>
</tr>
<tr>
<td>#12</td>
<td>F</td>
<td>50</td>
<td>LSL + RSL</td>
<td>MSin + ESin bilateral</td>
<td>No</td>
<td>2009</td>
<td>No</td>
</tr>
<tr>
<td>#13</td>
<td>F</td>
<td>51</td>
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<td>MSin + ESin + FSin</td>
<td>No</td>
<td>2009</td>
<td>No</td>
</tr>
<tr>
<td>#14</td>
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<td>55</td>
<td>RSL</td>
<td>MSin + AMM</td>
<td>No</td>
<td>2009</td>
<td>No</td>
</tr>
<tr>
<td>#15</td>
<td>F</td>
<td>59</td>
<td>LSL + RSL</td>
<td>MSin bilateral</td>
<td>SD + TurbHyper</td>
<td>2009</td>
<td>No</td>
</tr>
<tr>
<td>#16</td>
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<td>65</td>
<td>LSL</td>
<td>MSin + AMM</td>
<td>No</td>
<td>2009</td>
<td>No</td>
</tr>
<tr>
<td>#17</td>
<td>M</td>
<td>37</td>
<td>LSL</td>
<td>MSin + AMM</td>
<td>No</td>
<td>2010</td>
<td>No</td>
</tr>
<tr>
<td>#18</td>
<td>F</td>
<td>44</td>
<td>RSL</td>
<td>MSin + AMM</td>
<td>No</td>
<td>2010</td>
<td>No</td>
</tr>
<tr>
<td>#19</td>
<td>M</td>
<td>25</td>
<td>LSL + RSL</td>
<td>MSin + ESin bilateral + AMM</td>
<td>TurbHyper</td>
<td>2011</td>
<td>No</td>
</tr>
<tr>
<td>#20</td>
<td>F</td>
<td>44</td>
<td>LSL</td>
<td>MSin + ESin + FSin</td>
<td>TurbHyper</td>
<td>2011</td>
<td>No</td>
</tr>
</tbody>
</table>

LSL, left sinus lift; RSL, right sinus lift; Im, immediate implants; MSin, maxillary sinusitis; ESin, ethmoidal sinusitis; FSin, frontal sinusitis; FB, fungus ball; SD, septum deviation; AMM, alloplastic material migration; ABM, autogenous bone migration; CB, concha bullosa; TurbHyper, turbinate hypertrophy.
according to the position and dimension of the oro-antral communications, to allow a safe removal of the fistulae and a competent suture. The window used for the initial sinus grafting attempt was used (widen if necessary) to gain access to the maxillary sinus and to remove the remnants of the infected grafting material. These were generally localized on the floor of the maxillary sinus and in its anterior recess, as these areas are not easily reachable via the transnasal approach. In the two patients who had received dental implants in conjunction with sinus floor elevation [2, 13], a partial penetration of the implants into the sinus was observed: these were covered by a layer of septic material, and were therefore removed to eliminate any source of possible infection that could lead to relapse.

In total, five implants were removed, and fistulae were excised.

Before suturing the flaps, an additional endoscopic control was performed to verify the completion of the toettle of the maxillary sinuses. Sutures were then applied, after careful flap mobilization by means of periosteal incisions, to allow a tension-free, watertight closure of the surgical wound. In 8 of 20 patients, who presented large oro-antral communications due to the inadequate technique used for sinus floor elevation, to the subsequent chronic infection, and to the removal of implants that penetrated into the sinus cavity, a double layer closure of the communications was performed. The first layer was represented by a buccal fat pad flap sutured to the palatal side of the communication, while the second layer was represented by then by a buccal mucosal flap, sutured to the palate over the buccal fat pad flap.

Finally, after nasal and sinusal hemostasis was checked by direct inspection, a nasal package was applied.

Results

Post-operative recovery was uneventful for all patients, with a hospitalization period of 1 or 2 days. The nasal package was removed the day after the surgical intervention, and patients were instructed to (i) follow an antibiotic therapy (2 g/day in the following 7–10 days), (ii) perform nasal flushings with sterile saline and nasal applications of Mupirocin ointment, (iii) avoid blowing their nose for 15 days, (iv) follow a soft diet for 10–15 days, (v) maintain a thorough oral hygiene with the aid of 0.2% chlorhexidine mouthwashes until suture removal. Sutures were removed 10–12 days after surgery, post-operative controls were scheduled at 2–4–8–12–24–48 weeks, and annually thereafter. These controls, performed with nasal endoscopy, were associated at the 24-week appointment with a radiographic re-evaluation by means of cranio-facial CT scans in cases in which a reconstructive/implant rehabilitation was planned as a further step for the prosthetic rehabilitation of the patients.

In 16 of 20 patients, complete healing of the infected sites after surgery was obtained, together with the restoration of normal maxillary sinus ventilation and drainage, and ostium patency.

In 6 of 10 patients who undertook radiographic re-examination at the 24 weeks control, the CT scans showed normalization of the sinus mucosa, while in the remaining four cases, a residual thickening of the mucosa was observed: this, however, had no negative effects on the normal naso-sinusal functionality.

In 4 of 20 patients (#1, 3, 8, 18), despite an adequate antrostomy, a persisting suppuration with spontaneous drainage was still present 4 weeks after surgery, although in absence of the usual symptoms of maxillary sinusitis such as pain and feeling of tension. These patients underwent transnasal endoscopic aspiration of suppurative material samples followed by culture examination associated with antibioticogram. The presence of Staphylococcus Aureus was confirmed in two cases (#8, 18). According to the results of the antibioticogram, a new antibiotic therapy with Levofloxicin (750 mg/die for 15 days) was administered to the two patients for whom the presence of Staphylococcus Aureus was confirmed, and complete healing was achieved in 10 and 6 days, respectively. As far as the two other patients are concerned, culture examinations were negative and the attempt to treat the persisting infection with broad-spectrum antibiotics was unsuccessful. In one case (#3), a second transnasal endoscopic aspiration allowed the evacuation of the septic material and a subsequent spontaneous expulsion of three fragments of grafting material led to complete healing within 3 weeks. In the other case (#2), a second combined FESS and intra-oral procedure was performed: septic material was found into the maxillary sinus, and the apex of an implant (affected by peri-implantitis) placed in the canine region was found to protrude in the anterior recess of the sinus. The infected material and implant were removed, and a few days after surgery, all signs of infection rapidly regressed, until complete healing that occurred after 4 weeks.

None of the 20 treated patients showed signs of relapse after a follow-up period ranging from 1 to 6 years.

A clinical case is presented in Fig. 1a–p.

Discussion

The literature concerning infectious complications following sinus floor elevation and grafting is based solely on case reports and case series with a very limited patient sample (Quiney et al. 1990; Regev & Smith 1995; Raghoebar & Batenburg 1999; Maksoud 2001; Timmenga et al. 2001; Katranji et al. 2008).

This seems to be determined by the fact that post-operative complications, in particular infection, after sinus lifting procedures may be relatively uncommon, or rarely published.

As sinus floor elevation and grafting for implantological purposes has become nowadays a routine treatment, it is likely that in
the coming years this treatment will gain wider application and that the complications related to its use will be more frequent. To this day, however, due to the limited number of reported cases and the paucity of information available, no well-designed protocols have been proposed for the treatment of infectious complications related to maxillary sinus floor elevation.

The only aspects supported by significant data reported in the literature are the following: [i] post-operative complications after sinus grafting procedures are more frequent in patients with a history of sinusitis prior to the surgical intervention (Timmenga et al. 1997), [ii] some risk factors related to anomalies/alterations of the maxillary sinus-ostium-middle meatus complex exist, such as the concha bullosa, turbinate hypertrophy, significant septum deviation, and these alterations can interfere with the normal ventilation and clearance of the maxillary sinus (Timmenga et al. 1997; Schwartz-Arad et al. 2004; Pignataro et al. 2008; Mantovani 2009; Wallace 2010; Testori et al. 2011); [iii] the treatment of sinusitis refractory to medical therapy, irrespective of their origin (odontogenic or non-odontogenic) should not be treated with the traditional Caldwell–Luc approach anymore, because it proved to be ineffective with respect to the recovery of the physiological sinusal functions (Stammberger 1986; Stammberger et al. 1987; Penttilä et al. 1994).

For the first time to the Authors’ knowledge, a relevant survey of chronic/inveterate infectious complications following maxillary sinus floor elevation and grafting in association with specifically designed treatment protocols based on the combined FESS-intra-oral approach is presented in this study.

As far as FESS is concerned, a relevant number of studies have demonstrated how this procedure can be considered a relevant improvement as compared with the traditional Caldwell–Luc approach for several reasons: [i] it is less invasive; [ii] it allows for the recovery of the normal sinusal function, characterized by the spontaneous drainage from the natural ostium (even if widened), and not through an inferior meatotomy that does not permit, as widely demonstrated, an adequate sinus drainage; [iii] it eliminates the need for total sinus mucosa removal, as originally proposed by Caldwell and Luc; the mucosa, if left in place, once infection is treated, will recover to its original aspect and function in the majority of cases; [iv] by means of the transnasal endoscopic approach, it is possible to surgically manage in a minimally invasive way the other paranasal cavities possibly involved in the infection, which would not be reachable via an intra-oral approach; [v] by means of the endoscopic approach, it is possible to correct/eliminate the anatomic risk factors that might contribute as co-factors to infection relapse.

As far as this latter aspect is concerned, it is worth stressing that, even in healthy sinuses, the ostium-meatal complex generally has a small diameter. The presence of anatomic anomalies such as the concha bullosa, a relevant septum deviation, and turbinate hypertrophy may further reduce the sinusal clearance. In healthy conditions, these anomalies may be silent. On the contrary, in case of sinusal infection, the concomitant reactive hypertrophy of the mucosa of the ostium-meatus complex may contribute to render the sinus drainage very difficult or impossible, with scarce possibilities of compensation and healing. With the FESS approach, it is possible in one single surgery to treat all these aspects and factors and promote the functional recovery of the sinus, once the primary cause of infection is eliminated (the septic material dislocated into the sinusal cavity).

It is worth noting that one of the first studies that underlined the role of pre-existing naso-sinusal pathologies in augmenting the risk of complications following sinus lifting has been published by Timmenga et al. 1997). After that publication, this aspect has not been adequately developed. It is instead fundamental, in the light of data reported by Timmenga et al. in 1997 and in our study, to perform a thorough clinical and radiographic analysis prior to any implant treatment involving the maxillary sinus. For this scope, CT scans limited to the alveolar process and the floor of the maxillary sinus (such as DenTascan used for implantological purposes) are not recommended, because they do not allow to evaluate the naso-sinusal complex in its entirety, and to obtain adequate information regarding the other paranasal cavities and possible anatomic anomalies that may act as co-factors for the development of infectious complications after the sinus grafting procedures. Only cranio-facial CT scans with axial, coronal, and sagittal slices can provide all the information needed for diagnosis and treatment planning, as they allow to detect possible contraindications and/or risk factors to sinus floor elevation often silent from a clinical point of view. The early identification of these conditions permits their elimination before or during the sinus grafting procedure, as already proposed by some Authors [Rosenlicht 1999; Chiapasco et al. 2006a, 2006b; Pignataro et al. 2008].

As far as the intra-oral approach is concerned, it allows to complete the FESS treatment with procedures that it is not possible to perform from the nasal access, such as [i] the removal of infected implants with apical portions penetrating into the maxillary sinus; [ii] the removal of infected grafting material not retrievable via the endoscopic approach; and [iii] the closure of oro-antral communications.

Conclusions

Results from this study seem to demonstrate that, even if infrequent, infectious complications following sinus floor elevation and grafting may cause clinical situations sometimes very serious, and not treatable with a simple medical therapy or with a single surgical approach, be it endoscopic or intra-oral. It was demonstrated, instead, that a combination of FESS and an intra-oral approach can be considered the best option for the long-term resolution of these complications and for the restoration of a normal naso-sinusal homeostasis.

References


