

Maxillary postimplantation syndrome: ocular aspects

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Background: Maxillary postimplantation syndrome (MPS) has been previously described as a complication occurring more than 1 year after maxillary implant placement in patients with partial loss of teeth due to accident, extraction and/or local periodontal disease. The syndrome is characterized by dental, rhinological, ocular and/or neurodental symptoms.

Purpose: To determine frequencies of ocular disorders in patients who developed manifestations of maxillary postimplantation syndrome.

Materials and Methods: Seventy four patients with MPS (age, 27 to 64 years) and 43 healthy volunteers (age, 25 to 63 years) were involved in the diagnostic study. Patients underwent a routine clinical examination including rhinoscopy, stomatoscopy, and paranasal sinus computed tomography. In addition, a routine eye examination was performed.

Results: Ocular disorders were found in 81% of patients with MPS, and included functional injury of the nasolacrimal canal (51%), dacryocystitis (20.2%), and intermediate uveitis (6.7%) with complications manifesting as macular edema or epiretinal membrane (4.05%), optic nerve drusen (6.7%), and optic neuritis (5.4%). Some MPS patients exhibited several ocular disorders (including, in particular, a functional injury of the nasolacrimal canal or dacryocystitis).

Conclusion: Ocular disorders were found in 81% of patients with MPS. Patients with MPS should undergo an eye examination even in the absence of ocular complaints.

Introduction

Dental implant placement is an on-demand treatment option for patients with total or partial loss of teeth, and, like any surgery, has potential complications. Although intraoperative and postoperative complications within a year after implant placement have been well studied, some complications occurring more than 1 year after implant placement are poorly studied [1, 2]. It is identification, treatment and prevention of the latter complications that are an urgent problem. Maxillary postimplantation syndrome (MPS) has been previously [1-5] identified as an autonomous clinical entity, a complication occurring 1-5 years after maxillary implant placement in patients with partial loss of teeth due to accident, extraction or local periodontal disease. The syndrome is characterized by dental, rhinological, ocular and/or neurodental symptoms in the presence of pathological environmental afferent activity: bone lamella at least 0.5 mm thick above the implant body end, nasal septum deviation, osteomeatal complex defects or abnormalities, chameprosopic or mesoprosopic facial skeleton, mucociliary dyskinesia, inactive or reduced response to cooling, Misch D3 to D4 alveolar bone density, external carotid artery stenosis,

chronic maxillary sinusitis, facial pain, paresthesia of the upper lip, and hyperalgesia in the territory of the second branch of the trigeminal nerve [2, 3, 5].

The purpose of the study was to determine frequencies of ocular disorders in patients who developed manifestations of maxillary postimplantation syndrome.

Materials and Methods

Seventy four patients with MPS (age, 27 to 64 years) were involved in the diagnostic study. Of these, 44 (59.5%) had received unilateral dental implants, and 30 (40.5%), bilateral dental implants. The control group comprised 43 healthy volunteers (age, 25 to 63 years) without any symptoms of MPS.

The inclusion criteria were as follows: at least 12 months after implant placement; presence of left- or right-side implants only in the maxilla; absence of clinical manifestations of endocrine or cardiovascular diseases. Exclusion criteria were less than 12 months after implant

placement and taking regular medications for any chronic disease. Patients underwent a routine clinical examination including rhinoscopy, stomatoscopy, and paranasal sinus computed tomography. In addition, a routine eye examination was performed. The study protocol was approved by a local Bioethics Committee of the Odesa Medical University. Patients were fully informed about the diagnostic procedures involved, and signed an informed consent form.

Variation statistics were used for data analysis [6]. T test was used for pairwise comparisons, and the level of significance $p \leq 0.01$ was assumed.

Results and Discussion

Seventy four patients (100%) developed specific symptoms of maxillary rhinosinusitis including mucoid nasal discharge, nasal obstruction, and a sensation of pressure or tightness that involved the nose bridge area and was becoming more intense with head flexion. In addition, 55 patients (74.3%) had ocular complaints.

Of these, 42 (76.4%) complained mainly of tearing and tear stasis, 5 (9.1%) complained mainly of floaters or clouding of vision (of these 5 patients, 3 complained also of decreased vision), and 8 (14.5%) complained only of decreased vision. Some patients complaining of floaters, clouding of vision and/or decreased vision also complained of tearing and tear stasis.

Computed tomography of the maxilla and maxillary sinus provides some imaging also of orbit structures (Fig. 1). Bilateral changes in the maxillary sinuses were observed in all cases with bilateral placement of implants.

The tear sac was located at the typical anatomical location (i.e., at the level of the anterior end of the middle turbinate bone), posterior to this location, and significantly anterior to this location in only 31 (41.9%), 24 (32.4%), and 19 patients (25.7%), respectively, of the MPS group versus 73.7%, 15.8% and 10.5%, respectively, of the controls, and the differences were statistically significant ($p < 0.01$).

Symptoms of acute unilateral dacryocystitis were observed in 15 (35.7%) of the MPS patients complaining of tearing and tear stasis. These 15 patients all had CT findings of anatomical abnormalities in the maxillary sinus or osteomeatal complex, with 8 patients (53.3%) demonstrating changes in the maxillary sinus and 7 patients (46.7%), in the ethmoid sinuses.

In the rest 40 MPS patients (72.7%) complaining of tearing and tear stasis, the pathology was only functional in nature, and likely associated with persistent nasal mucosal swelling including nasolacrimal canal swelling on the affected side. Of these 40 patients, 11 had a negative result of dye disappearance test for assessment of lacrimal passage functional potency, and the rest demonstrated a delay of dye passage of the ocular surface and into the nose.

All 5 patients (9.1%) complaining of floaters or clouding of vision were diagnosed with subacute intermediate uveitis. The patients with complaints of

both floaters and decreased vision had already developed a posterior segment complication, either macular edema or epiretinal membrane, which was confirmed by optical coherent tomography (Fig. 2). None of the control group was diagnosed with uveitis.

In 2 (18.2%) of the 11 MPS patients with decreased vision, it was due to age-related changes, and these two patients were diagnosed with age-related macular degeneration (AMD). AMD was diagnosed in one patient (2.3%) of the control group. The study found no statistically significant difference in the risk of AMD between patients with MPS and controls.

Of the MPS patients with decreased vision, 6 (54.5%) were diagnosed with an optic nerve disorder, including 2 (33.3%) with anterior or posterior ischemic optic neuropathy and 4 (66.7%) with optic neuritis. Only one patient (2.3%) of the control group was diagnosed with an optic nerve disorder, anterior ischemic optic neuropathy that ran a symptomless course. Based on the data obtained, we can state that patients with MPS are at risk of developing optic neuritis. Whether patients with MPS are at risk of developing ischemic optic nerve disease is still an open question and requires further research with larger study cohorts. However, the pattern of blood supply of the carotid artery (CA) in these patients suggests that they are at risk of ischemic neuropathy.

Previously, we have found [3] CA injuries in 63.5% of patients with MPS versus 21.1% of the controls; the difference was statistically significant ($p < 0.01$). Unilateral CA injuries were ipsilateral to the implant side ($p < 0.02$). Mild, moderate and severe internal carotid artery stenosis in patients with MPS were found 3.47, 2.05 and 4.15 more frequently than in controls, and the difference was statistically significant ($p < 0.011$).

It is noteworthy that, in the current study, optic nerve drusen were observed in 5 (26.3%) of the 19 MPS patients without ocular complaints, or 6.8% of all the patients in the MPS group, versus 1 (2.3%) in the controls. These drusen were easily found on CT since they contain calcium. The numbers and percentages of patients with optic nerve drusen tended to increase with an increase in the number of implants placed (Table 1).

In adults, studies have found a prevalence of optic nerve drusen of 0.5 to 2.4% [7, 9]. A review by Chang and Pineles [9] includes lists of (a) 217 references related to optic nerve drusen and published until December 2015, (b) 26 ocular disorders reported in association with optic disc drusen, and (c) systemic disorders reported in association with optic disc drusen. An article by Foltzsch [10] was referenced in the review as the article reporting an association of optic nerve drusen with teeth and jaw anomalies.

In our opinion, optic nerve drusen are a symptom reasonably associated with MPS. In the previous study [1], anatomical abnormalities of the nasal septum, uncinat process, middle turbinate, and ethmoidal bulla, agger nasi cells, Haller cells, extramural frontoethmoidal cells, medial

orbital wall dehiscence, agger nasi cell hypertrophy, and accessory maxillary sinus ostium have been seen in 100%, 39.4%, 37.9%, 21.2%, 43.9%, 7.6%, 13.6%, 15.2%, 9.1% and 21.2%, respectively, of patients with MPS, compared with 48.2%, 17.9%, 14.3%, 12.5%, 19.6%, 3.6%, 5.4%, 3.6%, 3.6%, and 7.1%, respectively, in patients without complaints after maxillary dental implant placement.

Optic nerve drusen can be inherited or acquired [7, 9]. The etiopathogenetic role [7] of decreased activity of enzymatic systems, effect of aseptic inflammatory responses, development of secondary immune deficiency, and increased free radical oxidation in the development of drusen has been reported [4].

Therefore, ocular disorders were found in 81% of patients with MPS, and included functional injury of the nasolacrimal canal (51%), dacryocystitis (20.2%), and intermediate uveitis (6.7%) with complications manifesting as macular edema or epiretinal membrane (4.05%), optic nerve drusen (6.7%), and optic neuritis (5.4%). Some patients exhibited several ocular disorders (including, in particular, a functional injury of the nasolacrimal canal or dacryocystitis). Our finding of carotid artery stenosis led us to hypothesize that MPS is associated with the development of ischemic optic neuropathy. However, this question is still open and warrants further investigation. In addition, it is noteworthy that, in the presence of an ocular disorder in patients with MPS, they may have either no ocular complaints (e.g., in case of optic nerve drusen), or minor ocular complaints like floaters or clouding of vision in case of a rather serious disorder like intermediate uveitis.

Our findings stress the requirement for meticulous eye examination of patients with MPS even in the absence of ocular complaints.

Conclusions

Ocular disorders were found in 81% of patients with MPS. Patients with MPS should undergo an eye examination even in the absence of ocular complaints.

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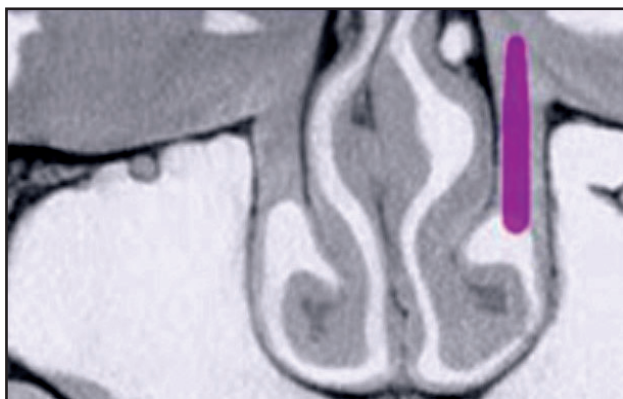


Fig. 1. Frontal plane CT of the maxilla and maxillary sinus in a MPS patient with acute right dacryocystitis. The normal nasolacrimal canal is marked with color

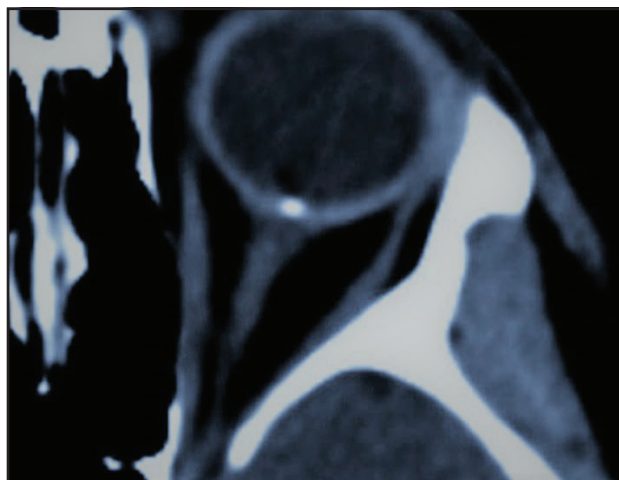


Fig. 3. Axial plane CT image showing optic nerve drusen

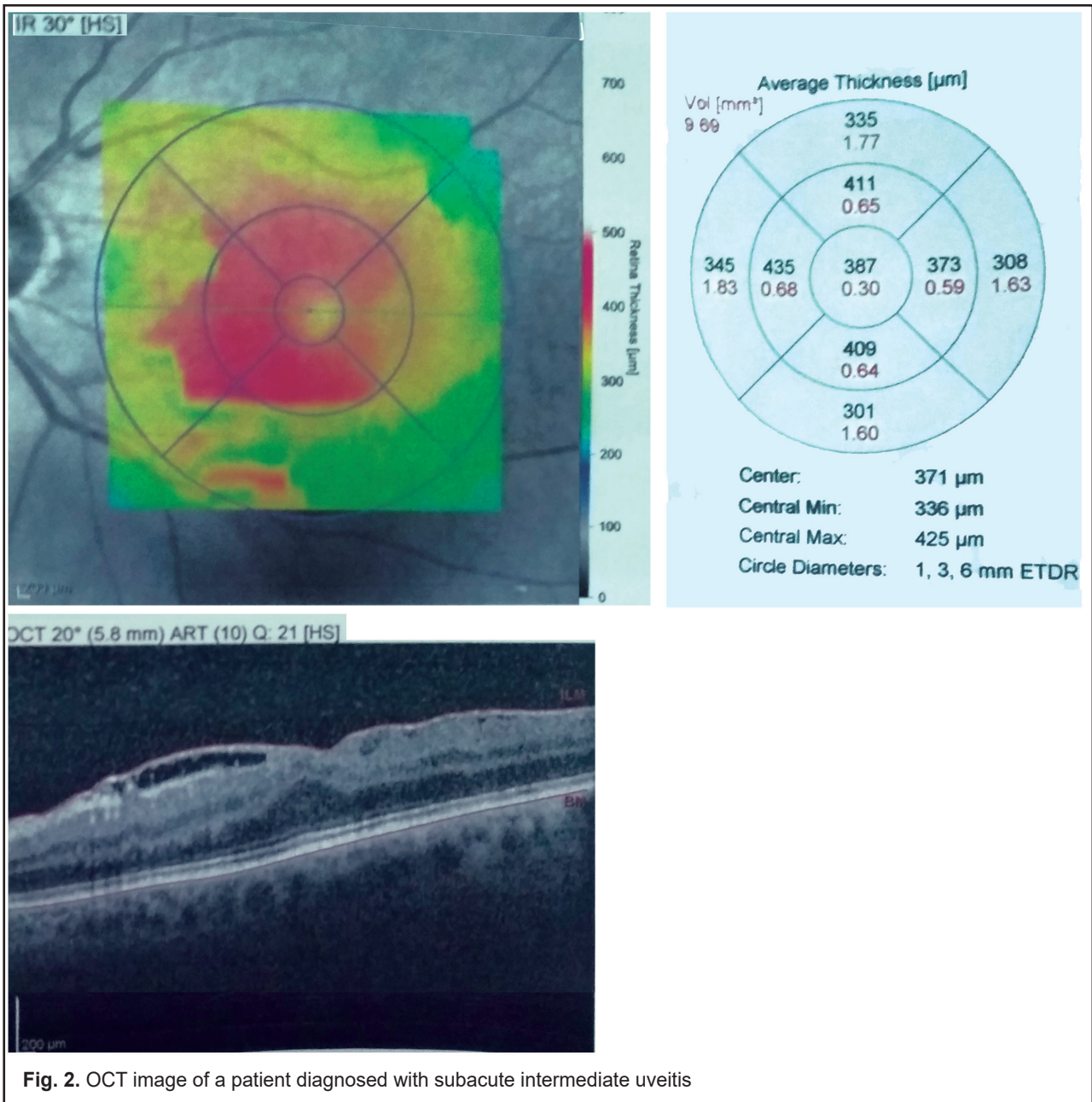


Table 1. Frequency of optic nerve drusen in MPS patients with different numbers of implants placed compared to controls

Groups	Numbers of implants placed in a patient	Number of patients	Numbers and percentages of patients with optic nerve drusen	
			n	%
MPS group, n=74	1 to 4	20	–	–
	5 to 8	31	1	3.2 (1,4)
	9 to 12	23	4	17.4 (5,4)
Control group, n = 43	–		1	2.3