



## DENTAL IMPLANTS INSIDE THE MAXILLARY SINUS – THREE CASE REPORTS AND PROPOSAL OF MANAGEMENT

<b>Zagalo, L</b>	Dental Surgeon, Center For Interdisciplinary Research Egas Moniz (CIIEM), Health Sciences Institute, 2829-511 Monte De Caparica, Portugal.
<b>Silva Marques, JM*</b>	Dental Surgeon, Auxiliary Professor , Center For Interdisciplinary Research Egas Moniz (CIIEM), Health Sciences Institute, 2829-511 Monte De Caparica, Portugal. *Corresponding Author
<b>Zagalo, C</b>	Medical Doctor, Otorhinolaryngology Specialist, Full Professor , Center For Interdisciplinary Research Egas Moniz (CIIEM), Health Sciences Institute, 2829-511 Monte De Caparica, Portugal.

### ABSTRACT

The placement of dental implants is a common practise in dentistry. From this procedure, complications may arise including the intrusion of the implant into the maxillary sinus, which occasionally occurs. The lining epithelium of the maxillary sinus propels its entire content towards the drainage hole. This, by the occlusion of the hole by foreign bodies, causes the frequent development of sinusitis, thus placing formal indication for their surgical removal. A computerized tomography scan of the paranasal sinuses (CT PNS) should be part of the preoperative evaluation to identify the exact location of the implant. The authors propose, illustrating three examples, the performance of Caldwell-Luc technique in situations in which the implant is submucous and performing endoscopic endonasal surgery in other situations. The latter technique allows for less sequelae and does not hinder the eventual achievement of sinus lifting afterwards.

**Resumo:** A utilização de implantes dentários é uma prática comum em Medicina Dentária. Este procedimento pode estar relacionado com complicações incluindo a intrusão de implantes no seio maxilar, o que ocorre ocasionalmente. O epitélio de revestimento do seio maxilar mobiliza todo o seu conteúdo até ao seu orifício de drenagem. A oclusão deste por corpos estranhos é causa frequente de desenvolvimento de sinusite, constituindo indicação formal para a remoção desses mesmos corpos. A obtenção de uma tomografia computadorizada dos seios perinasais (TC SPN) deve ser parte integrante da avaliação pré-operatória como forma de avaliação da localização exata do implante. Os autores propõem nos três exemplos apresentados a realização da técnica cirúrgica de Caldwell-Luc nos casos em que a localização do implante é submucosa e a cirurgia endoscópica endonasal em todas as outras situações. Esta outra técnica permite menos sequelas e não interfere com a eventual realização a posteriori de cirurgia de elevação do pavimento do seio maxilar (*sinus lifting*).

**KEYWORDS :** Maxillary sinus, implant, displacement, sinusitis, Caldwell-Luc, endoscopic surgery

### Introduction

Nowadays the placement of dental implants is very common and has a high success rate with a five-year survival rate of 93.9%.<sup>1</sup> However, there are cases of complications.<sup>1</sup> Among these, the accidental introduction into the maxillary sinus during implant placement or late intrusion due to lack of osseointegration happens occasionally.<sup>2</sup>

The maxillary sinus is lined by a respiratory epithelium, *i.e.*, pseudo stratified ciliated epithelium. The cilia propel all the content that rests on it, including foreign bodies, in a spiral-shaped movement inside the maxillary sinus towards the ostium.<sup>3</sup> As this hole is of reduced dimensions, naturally the implant will tend to occlude it, triggering a sinusitis process.<sup>4</sup> Thus, the extraction of these foreign bodies is formally indicated.<sup>5</sup>

To extract the implants, surgical accessibility must to be considered. If the implant is free within the maxillary sinus, the performance of endonasal endoscopic surgery, with the use of rigid endoscopes with several angulations, allows the access to practically the entire sinus.<sup>4</sup> Nevertheless, if the implant rests stuck under the Schneider's membrane the access using this technique becomes practically impossible, so the approach by Caldwell-Luc technique is an alternative.<sup>6</sup>

In this paper are shown three illustrative case reports of several hypotheses of presentation of this complication and is proposed a surgical approach methodology, differentiated according to the location of the implant, allowing us to determine the best procedure for each type of situation.

### Case Report

A 68-year-old female who placed three implants in the upper arch, appeared in four months later in consultation, and was verified the

absence of one of the implants, having not been identified oroantral fistula. The patient reported an uncomfortable sensation around the inner corner of the left eye. A panoramic radiography was performed, which confirmed the presence of a foreign body of high density in the left maxillary sinus. After performed CT of the sinuses, this revealed inside the left maxillary sinus a foreign body image of metallic density near the tear duct (Fig.1-2), which was identified as the missing mentioned implant. The radiological examination also revealed partial thickening of the mucosa of the same sinus compatible with sinusitis, however without osteoinfundibular stenosis, meaning a patent drainage hole. The remaining sinuses showed no changes. It has been proposed to carry out endoscopic endonasal surgery, having the implant extraction been performed using medial meatotomy, which is the expansion of the maxillary sinus orifice. The postoperative period was uneventful, having the complaints disappeared.

### Case Report 2

A 58-year-old male who placed twelve implants, six maxillary and six mandibular, to place two implant supported dentures. Three months later, in consultation, it was verified the absence of two of the upper implants, with no oroantral fistula. The patient complained of postnasal drip, eventually compatible with sinusopathy. A panoramic radiography was performed, which revealed the presence of an implant inside the left maxillary sinus and another near the right maxillary sinus floor, apparently covered by the lining of the sinus (Fig.3). It was performed CT of the sinuses to confirm the exact location of the implants. In this case the resolution passed by extraction of the left maxillary sinus implant by endoscopic endonasal surgery (Fig.4) and in the case of the right implant was necessary the realization of Caldwell-Luc technique (Fig.5), since this was in the coated mucosa of the maxillary sinus. The postoperative period progressed with a slight swelling and pain to palpation of the middle third of the right hemiface that recovered

after eight days.

**Case Report 3**

A 70-year-old male who placed three upper implants on the right, while placing the final implant, this was accidentally introduced into the maxillary sinus. The immediate panoramic radiography that was performed confirmed its presence on the maxillary sinus floor (Fig.6). The patient was asymptomatic, despite the presence of a small oroantral fistula at the point of placement of the final implant. Three weeks after, a new panoramic radiography was performed which showed that referred implant halfway up the side wall of the sinus, thus checking an offset of about two centimetres (Fig.7). It was verified at this point that the oroantral fistula had closed spontaneously. Once a CT scan was performed, it was confirmed the presence of a foreign body with metal density image compatible with the implant. It was proposed surgery, which was refused by the patient, citing the absence of symptoms. However, eight months after the initial surgery triggered a clinical picture of acute sinusitis by the occlusion of the maxillary sinus' hole. After this episode, which was treated with antibiotics, non-steroidal anti-inflammatories and nasal vasoconstrictor, was performed endoscopic endonasal surgery two months after the beginning of the symptoms described, and the postoperative elapsed without complications.

**Discussion**

The maxillary sinus is lined by a pseudo-stratified ciliated respiratory epithelium.<sup>7</sup> The cilia hit and propel mucus or other elements that are inside the maxillary sinus towards the exit hole, which is located in the upper portion of the medial wall of the maxillary sinus, at the level of the medial meatus.<sup>7</sup> This propulsion capacity is exemplified in the case 3 where the implant has moved two centimetres in three weeks (Fig. 6-7).

The displacement of dental implants, like any other foreign body that is located within the maxillary sinus can cause inflammation.<sup>8</sup> For the evaluation of the clinical condition is essential to perform a CT scan of the sinuses (CT PNS) for evaluating the location of the implant.<sup>9</sup> In the case of dental implants, which are made of biocompatible materials, the development of sinusitis is due to the occlusion of the sinus' drainage hole.<sup>4</sup> This occurred in two of the three cases. In case 1, in which there was no development of sinusitis, the implant was fixed nearby the nasolacrimal duct, causing foreign body sensation and discomfort within the inner corner of the eye. The authors conclude, therefore, that is always indicated surgical extraction of foreign bodies.

Among the techniques described for the removal of foreign bodies from the maxillary sinus are described, for example, Caldwell-luck technique<sup>6</sup>, endoscopic endonasal surgery<sup>5</sup>, magnetic iron<sup>10</sup>, saline irrigation<sup>11</sup> and suctioning<sup>11</sup>.

Based on the experience of the authors, the approach by endonasal endoscopic surgery allows solving most of these situations, as long as the foreign bodies are free within the maxillary sinus. This procedure allows there to be less edema, less pain, less risk of injury of the infraorbital nerve, less blood loss, no anterior bone window, absence of scarring within the oral vestibule and does not impede the eventual realization of sinus lifting *a posteriori*.<sup>12</sup> There are, however, cases where the implant is stuck under the Schneider's membrane, as exemplified by case 2 on the right. In these circumstances, the implant may eventually erode Schneider's membrane and free itself into the antral cavity and may beyond interfere with future dental procedures.<sup>6</sup> In these situations, the endoscopic extraction becomes a very difficult, or even impossible, technical achievement. It is proposed for these cases the approach by Caldwell-Luc technique.

**Conclusion**

In case of presence of free dental implants inside the maxillary sinus there is a formal indication for extraction due to the high incidence

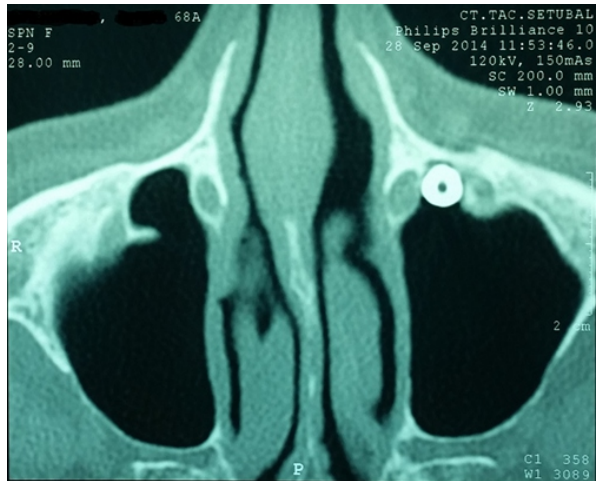
of sinusitis appearance.

During the preoperative assessment procedure, it is essential to carry out a CT scan of the paranasal sinuses for exact location of the implant shifted. In cases where the implant has submucosal location below Schneider's membrane, the proposed procedure will be extraction by Caldwell-Luck approach. In other cases, excision is possible with endoscopic endonasal surgery. This procedure allows there to be less oedema, less pain, less risk of injury of the infraorbital nerve, less blood loss, no anterior bone window, absence of scarring within the oral vestibule and does not impede the eventual realization of sinus lifting *a posteriori*.

**FIG 1 Case 1: TC coronal image showing the implant near lacromonasal channel**



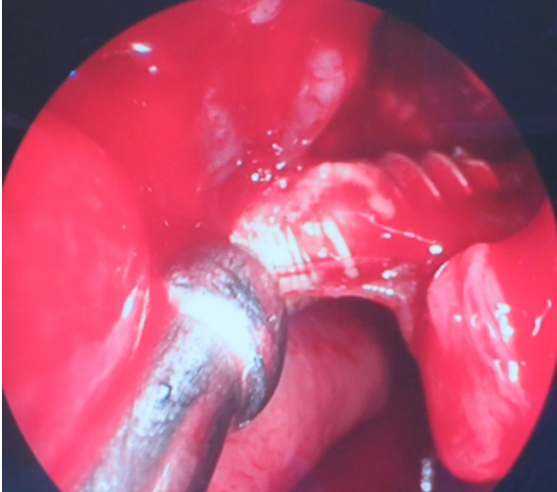
**FIG 2 Case 1: TC axial image showing the implant near lacromonasal channel**



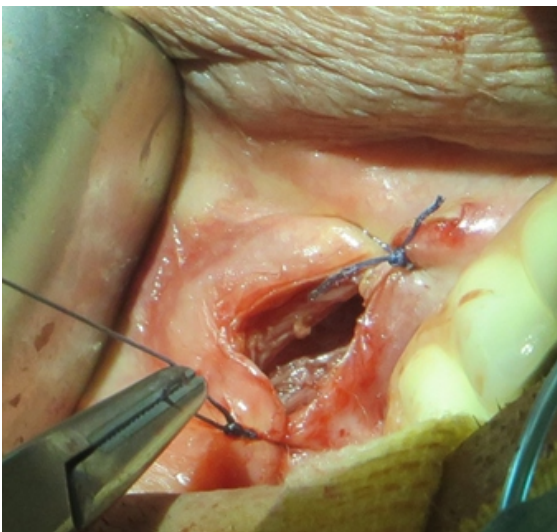
**FIG 3 Case 2: Ortopantomography showing one implant in each maxillary sinus**



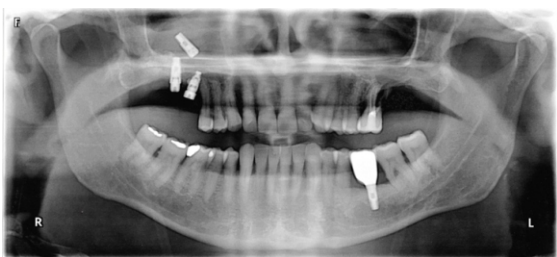
**FIG 4 Case 2: Dental implant being extracted trough the maxillary sinus' hole, previously enlarged by endoscopic procedures**



**FIG 5 Case 2: Caldwell-Luc image used for the extraction of the right sinus implant**



**FIG 6 – Case 3: Ortopantomography showing dental implant inside the right maxillary sinus, immediately after intrusion**



**FIG 7 Case 3: Same case three weeks later. Notice the lateral displacement of the dental implant.**



**Bibliography**

1. GUO Q, LALJI R, LE AV, JUDGE RB, BAILEY D, THOMSON W, ESCOBAR K. Survival rates and complication types for single implants provided at the Melbourne Dental School. *Aust Dent J.* 2015 Sep;60(3):353-61. doi: 10.1111/adj.12248.
2. NOGAMI S, YAMAUCHI K, TANUMA Y, ODASHIMA K, MATSUI A, TANAKA K, TAKAHASHI T. Removal of dental implant displaced into maxillary sinus by combination of endoscopically assisted and bone repositioning techniques: a case report. *J Med Case Rep.* 2016 Jan 12;10(1):1. doi: 10.1186/s13256-015-0787-1.
3. TOREMALM N, MERCCKE U, REIMOR A. The mucociliary activity of the upper respiratory tract. *Rhinology.* 1975 Nov;13(3):113-20.
4. KUNIHITO T, ARAKI Y, OBA T. Minimally invasive endoscopic middle meatal antrostomy for the prevention of maxillary sinusitis in association with dental implantation in the posterior maxilla—a proposal. *Fukuoka Igaku Zasshi.* 2014 Sep;105(9):182-9
5. SAHIN YF, MUDERRIS T, BERCIN S, SEVIL E, KIRIS M. Chronic maxillary sinusitis associated with an unusual foreign body: a case report. *Case Rep Otolaryngol.* 2012;2012:903714. doi: 10.1155/2012/903714. Epub 2011 Oct 13.
6. HUANG IY, CHEN CM, CHUANG FH. Caldwell-Luc procedure for retrieval of displaced root in the maxillary sinus. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 2011 Dec;112(6):e59-63. doi: 10.1016/j.tripleo.2011.05.018. Epub 2011 Aug 26.
7. STAMMBERGER HR, KENNEDY DW. Paranasal sinuses: anatomic terminology and nomenclature. *Ann Otol Rhinol Laryngol Suppl.* 1995 Oct;167:7-16.
8. FURUYA Y, NORIZUKI Y, YAJIMA Y. A Case of Simultaneous Ectopic Tooth Extraction and Removal of Migrated Dental Implant from Maxillary Sinus. *Bull Tokyo Dent Coll.* 2015;56(4):253-8. doi: 10.2209/tdpublication.56.253.
9. TADINADA A, FUNG K, THACKER S, MAHDIAN M, JADHAV A, SCHINCAGLIA GP. Radiographic evaluation of the maxillary sinus prior to dental implant therapy: A comparison between two-dimensional and three-dimensional radiographic imaging. *Imaging Sci Dent.* 2015 Sep;45(3):169-74. doi: 10.5624/isd.2015.45.3.169. Epub 2015 Sep 9.
10. SHAO L, QIN X, MA Y. Removal of maxillary sinus metallic foreign body like a hand sewing needle by magnetic iron. *Int J Clin Pediatr Dent.* 2014 Jan;7(1):61-4. doi: 10.5005/jp-journals-10005-1237. Epub 2014 Apr 26.
11. SOHN DS, JUUNG HS, KIM KH, SONG KJ, AN HW, MIN KH. Removal of displaced foreign body from the maxillary sinus using replaceable bony windows and saline irrigation, followed by suctioning of the foreign body. *Implant Dent.* 2011 Apr;20(2):112-7. doi: 10.1097/ID.0b013e31820faf53.
12. IKEDA K, HIRANO K, OSHIMA T, SHIMOMURA A, SUZUKI H, SUNOSE H, KONDO Y, TAKASAKA T. Comparison of complications between endoscopic sinus surgery and Caldwell-Luc operation. *Tohoku J Exp Med.* 1996 Sep;180(1):27-31.