

SURGICAL REMOVAL OF FOREIGN BODIES FROM THE MAXILLARY SINUSES: A CASE SERIES

REMOÇÃO CIRÚRGICA DE CORPOS ESTRANHOS DOS SEIOS MAXILARES:
SÉRIE DE RELATOS DE CASOS

EXTRACCIÓN QUIRÚRGICA DE CUERPOS EXTRAÑOS DE LOS SENOS
MAXILARES: UNA SERIE DE INFORMES DE CASOS

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ABSTRACT

The presence of foreign bodies in the maxillary sinus represents an uncommon, yet clinically relevant, complication in dental practice. Various objects can be displaced into this cavity, such as dental roots, intact teeth, dental implants, surgical burs, fragments of endodontic instruments, and filling materials. Accurate diagnosis supported by imaging and appropriate planning are essential to prevent infectious complications and ensure complete foreign body removal. This study presents four clinical cases of foreign bodies displaced into the maxillary sinus, which were successfully removed surgically through variations of the Caldwell-Luc approach, involving adequate exposure, copious irrigation, and suture closure. This resulted in favorable post-operative evolution and the absence of sinus complications. This study reinforces the importance of early diagnosis, individualized planning, and the careful selection of the surgical access route. The Caldwell-Luc access remains a safe, predictable, and effective technique for the removal of voluminous or difficult-to-access foreign bodies, maintaining its relevance even when facing contemporary minimally invasive approaches.

Keywords: Maxillary Sinus. Foreign Bodies. Dental Implants. Oral Surgical Procedures.

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RESUMO

A presença de corpos estranhos no seio maxilar representa uma complicação incomum, porém clinicamente relevante na prática odontológica. Diversos objetos podem ser deslocados para essa cavidade, como raízes dentárias, dentes íntegros, implantes dentários, brocas cirúrgicas, fragmentos de instrumentais endodônticos e materiais de preenchimento. O diagnóstico preciso apoiado em exames de imagem e o planejamento adequado são fundamentais para evitar complicações infecciosas e garantir a remoção completa do corpo estranho. Este trabalho apresenta quatro casos clínicos de corpos estranhos deslocados para o seio maxilar, removidos cirurgicamente com sucesso por meio de variações do acesso de Caldwell-Luc, com adequada exposição, irrigação abundante e fechamento com fio de sutura, resultando em evolução pós-operatória favorável e ausência de complicações sinusais. Este estudo reforça a importância do diagnóstico precoce, do planejamento individualizado e da escolha criteriosa da via de acesso cirúrgico. O acesso de Caldwell-Luc permanece como uma técnica segura, previsível e eficaz na remoção de corpos estranhos volumosos ou de difícil acesso endoscópico, mantendo sua relevância mesmo frente às abordagens minimamente invasivas contemporâneas.

Palavras-chave: Seio Maxilar. Corpos Estranhos. Implantes Dentários. Cirurgia Bucal.

RESUMEN

La presencia de cuerpos extraños en el seno maxilar representa una complicación poco común, pero clinicamente relevante, en la práctica odontológica. Diversos objetos pueden desplazarse hacia esta cavidad, como raíces dentales, dientes intactos, implantes dentales, fresas quirúrgicas, fragmentos de instrumentos endodónticos y materiales de obturación. Un diagnóstico preciso, respaldado por estudios de imagen y una planificación adecuada, son fundamentales para evitar complicaciones infecciosas y asegurar la extracción completa del cuerpo extraño. Este artículo presenta cuatro casos clínicos de cuerpos extraños desplazados hacia el seno maxilar, extraídos quirúrgicamente con éxito mediante variaciones del abordaje Caldwell-Luc, con exposición adecuada, irrigación abundante y cierre con hilo de sutura, lo que resultó en una evolución postoperatoria favorable y ausencia de complicaciones sinusales. Este estudio refuerza la importancia del diagnóstico precoz, la planificación individualizada y la selección cuidadosa del abordaje quirúrgico. El abordaje Caldwell-Luc sigue siendo una técnica segura, predecible y eficaz para la extracción de cuerpos extraños endoscópicos grandes o de difícil acceso, manteniendo su relevancia incluso frente a los abordajes mínimamente invasivos contemporáneos.

Palabras clave: Seno Maxilar. Cuerpos Extraños. Implantes Dentales. Procedimientos Quirúrgicos Orales.



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INTRODUCTION

The presence of foreign bodies in the maxillary sinus is a relatively rare, but relevant, complication in dental and otorhinolaryngological practice. It is estimated that between 11% and 16% of unilateral maxillary sinusitis cases are associated with the presence of foreign bodies, with an odontogenic origin being responsible for the majority of occurrences (TILAVERIDIS *et al.*, 2022). These foreign bodies can result from dental surgical procedures, facial trauma, or spontaneous migrations due to undiagnosed oro-antral communications (COSTA *et al.*, 2006).

The objects most frequently found include dental roots, intact teeth, dental implants, surgical burs, fragments of endodontic instruments, and filling materials, which can generate non-specific symptoms or chronic, difficult-to-resolve sinusopathies (PRED *et al.*, 2021; ALI *et al.*, 2023). Correct identification and three-dimensional localization of the foreign body are crucial, with computed tomography (CT) or cone-beam computed tomography (CBCT) being the examination of choice for evaluating the extent of the lesion and surgical planning (HALLAK *et al.*, 2021).

Various approaches have been described for the removal of foreign bodies from the maxillary sinus. Transnasal endoscopic techniques have gained prominence due to their lower morbidity and better internal visualization, especially in cases of small volume and anterior location (PRED *et al.*, 2021). However, the Caldwell-Luc access, initially described by George Caldwell in 1893 and popularized by Luc in 1897, remains an effective and safe alternative, especially in situations involving voluminous or difficult-to-access bodies, or when the endonasal route is not viable (HAJIOIOANNOU *et al.*, 2016; TILAVERIDIS *et al.*, 2022). This classic procedure consists of performing a lateral antrostomy through the anterior wall of the maxillary sinus, allowing direct access to the cavity for foreign body removal, biopsies, or drainage of chronic secretions, and is particularly indicated in cases of extensive changes or posterior and superior locations.

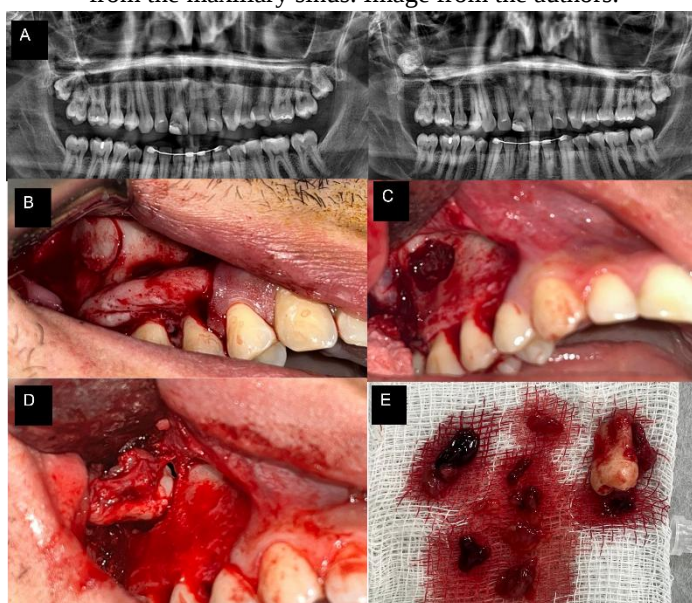
The objective of this study is to report four cases of foreign bodies displaced into the maxillary sinus and to discuss the surgical strategies used, with emphasis on the Caldwell-Luc technique.

CASE REPORTS

Case 1 – Tooth Displaced Into the Right Maxillary Sinus

A 28-year-old male patient, with no comorbidities, was indicated for extraction of the upper third molars (teeth 18 and 28). During the procedure, accidental displacement of tooth 18 into the right maxillary sinus occurred, which was confirmed by panoramic radiography. Under local anesthesia, a surgical access to the lateral wall of the maxillary sinus was performed with a trephine bur. After osteotomy, the cavity was irrigated copiously with saline solution, allowing the location and removal of the tooth with a Kelly hemostatic forceps. The sinus was irrigated again and the incision was sutured with 5-0 nylon thread. The patient had a favorable post-operative evolution, without intercurrents or signs of sinusopathy during outpatient follow-up (Figure 1).

Figure 1. A. Panoramic radiography showing the patient's initial condition and the accidental displacement of the upper right third molar into the maxillary sinus; B-C. Bone window performed with a trephine bur on the lateral wall of the sinus; D. Tooth located and ready to be removed with the aid of forceps; E. Tooth after being removed from the maxillary sinus. Image from the authors.



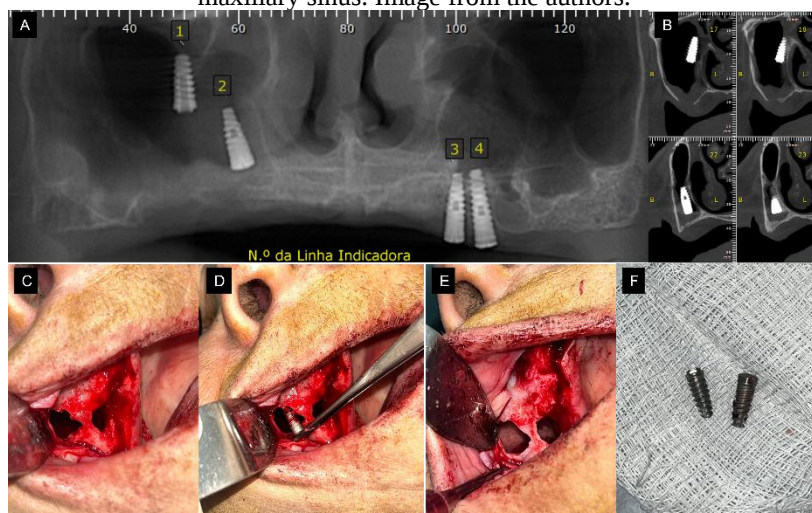
Source: Photographs and X-rays of the authors. 2026.

Case 2 – Dental Implants Displaced Into the Right Maxillary Sinus

A 73-year-old female patient, with no history of comorbidities or continuous medication use, suffered accidental displacement of two dental implants into the right maxillary sinus during

a rehabilitation procedure with dental implants. Face computed tomography (CT) confirmed the location of the foreign bodies in the sinus cavity. The proposed treatment was surgical removal under local anesthesia, using the Caldwell-Luc technique. Two bone windows were created in the anterior wall of the sinus to optimize visualization, allowing the implants to be grasped and removed with a Dietrich forceps. The cavity was irrigated copiously with saline solution and the surgical wound was sutured with 5-0 nylon thread. The patient evolved with adequate healing and absence of sinus complications during outpatient follow-up (Figure 2).

Figure 2. A-B. Face CT scan showing the presence of two dental implants inside the right maxillary sinus; C. Bone window performed with burs; D. Grasping the implant with Dietrich forceps; E. Right maxillary sinus after removal of the implants and irrigation with saline solution; F. Dental implants after being removed from the right maxillary sinus. Image from the authors.

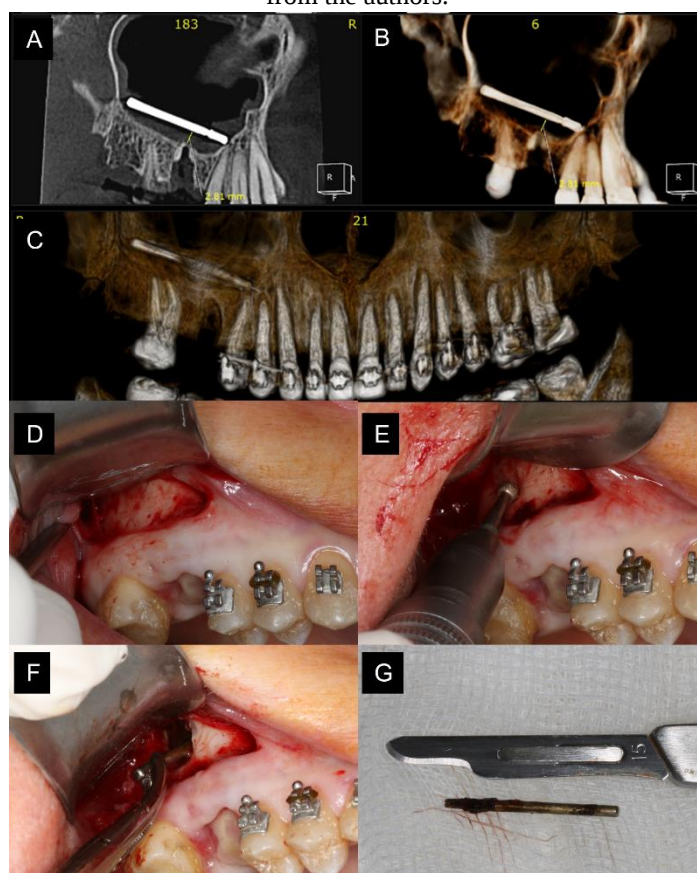


Source: Photographs and X-rays of the authors. 2026.

Case 3 – Surgical bur Displaced Into the Right Maxillary Sinus

The third case, a 65-year-old female patient, with no history of comorbidities or continuous medication use, was referred to our service with a history of displacement of a surgical bur during the odontosection of a maxillary molar during an extraction, displacing the object into the maxillary sinus. The face CT scan confirmed the presence of the object in the right maxillary sinus. A modified Caldwell-Luc approach was performed, where the bone window was designed more posteriorly in the zygomatic pillar region. After locating the surgical bur, it was removed with Kelly forceps. The site was properly irrigated and sutured with 4-0 nylon thread. The patient was followed up on an outpatient basis, with good healing, no complications and absence of sinusopathies (Figure 3).

Figure 3 – A-B-C. Face CT scan showing the presence of a surgical bur inside the right maxillary sinus; D-E. Surgical access to the maxillary sinus performed with a bur under copious irrigation; F. Grasping the surgical bur with Dietrich forceps; G. Size comparison of the surgical bur with a 15 blade and No. 03 scalpel handle. Image from the authors.

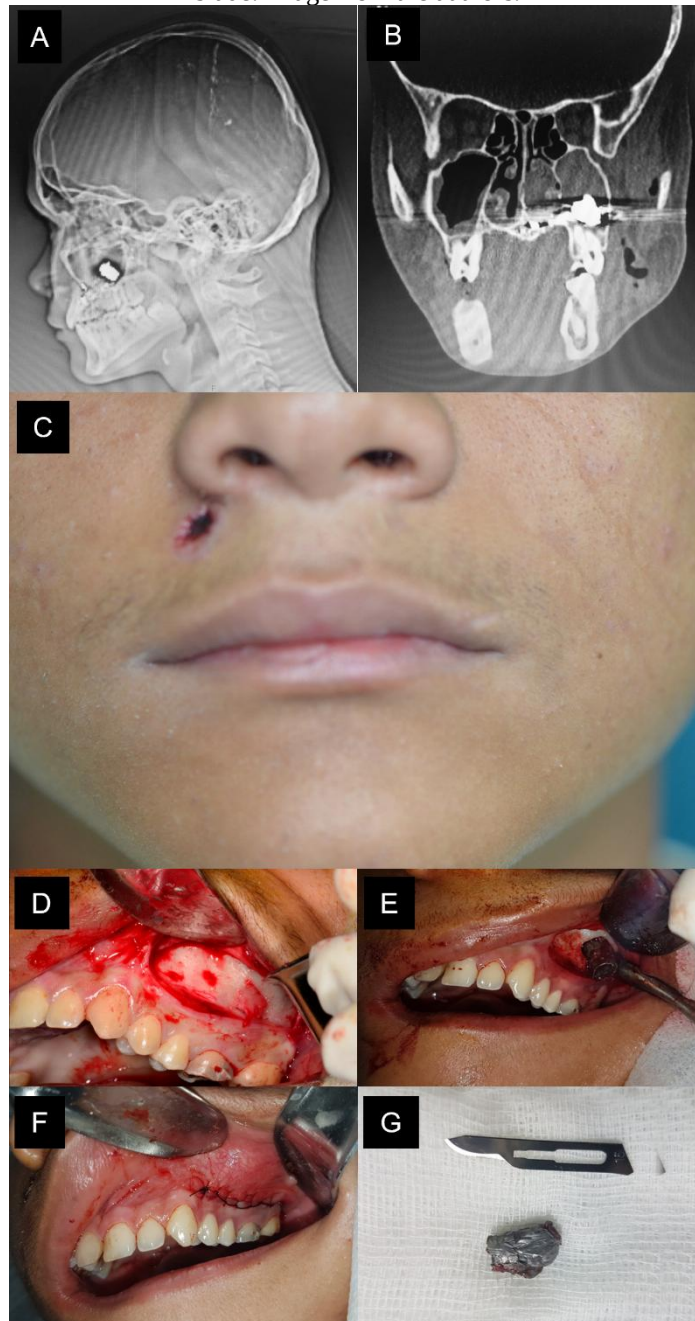


Source: Photographs and X-rays of the authors. 2026.

Case 4 – Gunshot Projectile Displaced Into the Left Maxillary Sinus

The fourth case involves a 15-year-old male patient, who was the victim of a gunshot wound (GSW), with the entry hole of the projectile (GP) on the right hemiface, close to the nasal ala, with no exit hole. A face CT scan showed the projectile lodged in the left maxillary sinus. A Caldwell-Luc approach was performed again for exploration of the maxillary sinus under local anesthesia. The projectile was removed and copious irrigation was performed. The surgical removal of the projectile occurred satisfactorily and conservatively. The patient evolved well, without complications due to the injury and treatment performed. The patient was followed up on an outpatient basis, with no complications and absence of sinusopathies (Figure 4).

Figure 4 – A-B. Face CT scan showing the presence of a gunshot projectile inside the left maxillary sinus; C. Initial appearance of the patient's face showing the entry hole on the upper lip next to the right nasal ala; D. Surgical access to the left maxillary sinus performed with a bur under copious irrigation; E. Grasping the projectile with Kelly forceps; F. Suture of the access with 5-0 nylon thread; G. Size comparison of the projectile with a 15 blade. Image from the authors.



Source: Photographs and X-rays of the authors. 2026.

DISCUSSION

The presence of foreign bodies inside the maxillary sinus, although considered an uncommon complication, has been reported with increasing frequency in the literature, especially

associated with dental procedures, such as extractions and implant placement (WOJTERA *et al.*, 2022). The iatrogenic etiology remains the most common, involving accidental displacement of teeth, root fragments, instruments, and implants, but there are also records of traumatic foreign bodies, such as gunshot projectiles (BENNARDO *et al.*, 2022).

Accurate diagnosis and adequate surgical planning fundamentally depend on three-dimensional imaging. Cone-beam computed tomography (CBCT) is currently the method of choice for evaluating sinus anatomy and the exact location of the foreign body, in addition to allowing the identification of oro-antral communications and assisting in defining the access route (YEUNG *et al.*, 2022). In all cases reported in this series, the use of tomographic exams was essential for surgical planning and for deciding on the safest approach.

The choice of surgical access route must be individualized, considering the location, volume, and nature of the foreign body, as well as the team's experience and the patient's clinical conditions. Recent studies highlight that endonasal endoscopic approaches present lower morbidity and better functional results in selected cases, especially when the foreign body is located in the superior or medial portion of the sinus (CHOI; LEE; HAN, 2024). In parallel, the evolution of minimally invasive techniques gave rise to modified endoscopic transoral sinus surgery (MESS), which combines transoral access with endoscopic assistance, allowing direct visualization and minimal tissue aggression (CHOI; LEE; HAN, 2024). This approach represents a modern alternative to the traditional Caldwell-Luc technique, especially in cases of small and accessible bodies.

However, the Caldwell-Luc access maintains a prominent role and remains widely indicated in situations where the foreign body is located in anteroinferior regions, is of large volume, or is difficult to access via the endonasal route, as well as in cases where wide surgical exposure is required (WOJTERA *et al.*, 2022; HAJIOIOANNOU *et al.*, 2016). In the cases described in this work, the Caldwell-Luc access proved to be safe and effective, allowing complete removal of the foreign bodies without post-operative complications.

The literature emphasizes the importance of early removal of foreign bodies to prevent infectious complications and chronic, difficult-to-resolve sinusitis (BENNARDO *et al.*, 2022). Retrospective studies report that prolonged maintenance of foreign materials can lead to persistent inflammation, recurrent infection, and irreversible mucosal changes. The favorable evolution observed in the four cases described in this series is consistent with such evidence, reinforcing the need for immediate intervention when the diagnosis is established.

With the advancement of minimally invasive techniques, the integration of surgical simulation software based on CBCT and, when available, the use of intraoperative navigation, can optimize the precision of removal and reduce surgical time (SATO *et al.*, 2019). These tools represent a promising advance in the management of foreign bodies located in difficult-to-access regions of the maxillary sinus.

Despite the positive results of this series, the limitation of the number of cases and the descriptive nature of the study are recognized, which does not allow statistical comparisons between the different techniques. Even so, the findings reinforce the essential role of imaging diagnosis, individualized planning, and careful technical execution. Future prospective and multicenter studies are needed to consolidate standardized clinical protocols and systematically compare the different surgical approaches available.

The cases reinforce that the choice of access route must be based on the anatomical location and the type of foreign body, with the Caldwell-Luc access still being a safe and resolute method, especially in contexts of limited endoscopic field. The presence of foreign bodies inside the maxillary sinus, although considered an uncommon complication, has been reported with increasing frequency in the literature, especially associated with dental procedures, such as extractions and implant placement (WOJTERA *et al.*, 2022). The iatrogenic etiology remains the most common, involving accidental displacement of teeth, root fragments, instruments, and implants, but there are also records of traumatic foreign bodies, such as gunshot projectiles (BENNARDO *et al.*, 2022).

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CONCLUSION

The reports highlight the relevance of diagnosis combined with the appropriate surgical technique in preventing the displacement of foreign bodies into the maxillary sinus. The Caldwell-Luc access, when performed correctly, broadly, and under adequate lighting, proves to be an effective resource for the approach and removal of foreign bodies located inside the maxillary sinus.

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