

# Impacted Foreign Bodies in the Maxillofacial Region—Diagnosis and Treatment

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**Abstract:** Foreign bodies are often encountered by oral and maxillofacial surgeons and may present a diagnostic challenge to the trauma surgeon due to many factors such as the size of the object, the difficult access, and a close anatomic relationship of the foreign body to vital structures. They are usually a result of injuries or operations. Fragments of broken instruments can be left behind and entire teeth or their fragments can be displaced during extraction. The approach to this kind of injury should be sequential and multidisciplinary, beginning with the trauma unit that will provide maintenance of the airways, hemodynamic stabilization, and, but only if necessary, neurologic, ophthalmologic, and vascular evaluation. With a view to illustrating and discussing the diagnosis and treatment of this kind of injury, this study reports impacted foreign bodies in oral and maxillofacial region. The following data were collected: age, sex, race, etiology, occurrence of fracture, anatomic location of the fracture, daytime of the traumatic event, type of the object, signal and symptoms, type of imaging examination used, type of anesthesia, approach, transoperative complication, period between surgery and hospital liberation, and the occurrence of death. Foreign body injuries in the maxillofacial region can place the patient's life at risk, so a correct initial treatment performed by a multidisciplinary team increases the survival of this kind of patient.

**Key Words:** Maxillofacial region, foreign body, stab wound

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Foreign bodies are often encountered by oral and maxillofacial surgeons, and it can present a diagnostic challenge to the trauma surgeon due to many factors such as the size of the object, the difficult access, and a close anatomic relationship of the foreign

body to vital structures.<sup>1–3</sup> They are usually a result of injuries or operations. Fragments of broken instruments can be left behind, and the entire teeth or their fragments can be displaced during extraction.<sup>2–6</sup>

The term Jael syndrome is used when an intentional wound in the skull-face region was caused by a knife.<sup>7</sup> This term has been used in the literature based on the biblical story on the murder of Sisera committed by Jael (Judah IV: 21). According to McKechnie,<sup>8</sup> the first report of this syndrome was attributed to Jefferson in 1968, who described a serious accidental wound in the temporal region of a 16-year-old adolescent boy.

Knife wounds in the maxillofacial region are relatively rare. However, those in which the object is impacted are extremely rare, and there are few articles in the world literature.<sup>9,10</sup> This kind of wound can lead to the death of the patient, as it can harm major blood vessels and cause bleeding. When there is communication of the wound with the buccal or nasal cavity, the bleeding can also cause blockage of the airways.<sup>11</sup>

Removal of the foreign body can be delayed in approximately one third of all foreign bodies because they are initially radiologically missed or misdiagnosed.<sup>12</sup> The foreign body can often modify the regional anatomy. Tissue can be damaged by gunshot wounds or altered by scarring after an operation that resulted in an iatrogenic foreign body.<sup>1</sup> Inflammatory response in the tissues around a foreign body can add difficulties.<sup>13</sup> There are many ways of detecting and localizing foreign bodies. Plain radiographs, computed tomographic (CT) scans, magnetic resonance images, and ultrasound can be used, depending on their site and composition.<sup>14,15</sup> Infection associated with retained foreign bodies in the face has been a notable feature of previous cases.<sup>4</sup> Because the lesions were contaminated, antibiotics must be prescribed as well as tetanus prophylaxis.<sup>16</sup>

The approach to this kind of injury should be sequential and multidisciplinary, beginning with the trauma unit that will provide maintenance of the airways, hemodynamic stabilization, and, but only if necessary, neurologic, ophthalmologic, and vascular evaluation.<sup>7,17</sup>

With a view to illustrating and discussing the diagnosis and treatment of this kind of injury, this study reports impacted foreign bodies in oral and maxillofacial region.

## MATERIALS AND METHODS

Twenty patients consecutively treated at the oral and maxillofacial surgery department of a public hospital in the city of Recife, Pernambuco, Brazil, presenting to the emergency unit with impacted foreign bodies in the oral and maxillofacial region between January 2008 and January 2010, were evaluated retrospectively. All the patients were subjected to a detailed clinical and imaging diagnostic. Hence, these patients had been submitted to surgical treatment to

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remove the foreign bodies with different degrees of severity. After local or general anesthesia by orotracheal or nasotracheal intubation, the foreign body was removed back along the path of insertion, taking care of hemostasis. The wounds were copiously irrigated with physiological solution and sutured by planes. The patients received tetanus prophylaxis and antibiotic therapy.

The study included patients who had impacted foreign bodies, of which removal was indicated. The following data were collected: age, sex, race, etiology, occurrence of fracture, anatomic location of the fracture, daytime of the traumatic event, type of the object, signal and symptoms, type of imaging examination used, type of anesthesia, approach, transoperative complication, period between surgery and hospital liberation, and occurrence of death.

## RESULTS

The collected data from the patients are shown in Table 1. The mean age of the patients was 28 years. There was predominance of male and white people. The main etiological factor was accident when practicing an activity such as fishing or carrying a weapon and physical aggression ( $n = 7$  cases each). The fracture was present in 12 cases, and the orbit region was more affected, with 8 cases. Saturday night was the most frequent time of the traumatic event. A wooden rod was the most frequently found foreign body ( $n = 6$ ). The most frequent symptom was pain ( $n = 18$ ). Computed tomography was used in 11 cases. The foreign body was removed under general anesthesia in 15 cases, with the same path of insertion being used in 13 patients. The only 2 transoperative complications observed were associated with brain injury and death of these patients. The period between surgery and hospital liberation was 24 hours in 8 patients (other day).

## DISCUSSION

Impacted knife injuries are rarely described in the world literature. Cohen and Boyes-Varley<sup>18</sup> reported 4 cases of a 37-patient series with penetrating injuries in the face. Hudson,<sup>17</sup> in a study in South Africa, observed 4 cases during a 4-year period. Subburaman et al<sup>10</sup> reported a more recent case similar with 1 of the 2 cases described in this article, in which the knife penetrated below the lower left inferior eyelid, communicated with the oral cavity and lacerated the palate (Figs. 1A, B).

A review of the socioeconomic aspects of 254 victims of knife and firearm injuries was made by Jett et al.<sup>19</sup> The characteristics of the studied patients were as follows: black, males, aged between 15 and 35 years, drug users, and with low socioeconomic profile. The incidents had generally occurred on a Friday or a Saturday night, between 9 P.M. and 2 A.M., and were caused by fights at home. The reported cases in this work partially corroborates to the last cited article; most patients were males, with a mean age of 28 years. Physical aggression was the etiologic factor of 7 cases, with 3 of them in black patients. The cases occurred mainly on a Saturday night (4 cases) including 2 cases of physical aggression.

The clinical examination of the patient who presented an impacted object injury in the face should be carried out in a systematic manner.<sup>17</sup> The paranasal region is the most affected by this kind of injury, and it is important to observe the major anatomic structures, such as the facial nerve and the parotid gland and duct.<sup>18</sup> Active wound bleeding, presence of increasing hematoma, a low level of hemoglobin, and signs of hypovolemic shock during admission are indications of associated vascular injury.<sup>20</sup> Ocular acuity and mobility should be investigated because penetrating wounds in the ocular orbit are frequently associated with severe ocular trauma.<sup>7,18</sup> In this case series, 8 cases involved the orbit region, with 4 cases having fractures. It was showed that the presence or ab-

sence of fractures could not be a premise to establish that the wound would induce amaurosis because 3 of 5 cases with amaurosis did not show fracture and the injury to the eyeball occurred directly because of the foreign body or high temperature, when the foreign body penetrated between the eyeball and the orbital bone area (Figs. 2A–D and 3).

Removal of the foreign bodies can be delayed because of a misdiagnosis or because of their asymptomatic behavior.<sup>12,21,22</sup> A foreign body may also remain asymptomatic for a long time and finally present acute symptoms.<sup>4,6</sup> In the reported case 3, the patient's reason for delaying the removal was fear from surgery. Furthermore, despite the consequences of foreign bodies in the case, it remained asymptomatic for months.

Plain radiographs are usually the first additional examination to be requested owing to its low cost and easy access. It may be useful in identifying and locating foreign intraorbital bodies, reaching rates of detection of 69% to 90% of metallic foreign bodies and 71% to 77% in glass cases; however, it has little rate for identification of organic material such as wood (0%–15%).<sup>23,24</sup> Two radiographs (frontal and lateral) should be obtained to determine the location of the foreign body and its relationship with the skull fosse.<sup>7,9,16</sup> In this case series, posterior-anterior and lateral skull radiographs were obtained to confirm the descending trajectory of the foreign bodies. In more complex cases, CT is essential, being an important means of diagnosing neurologic injuries. When vascular injury or anatomic proximity to great vessels is suspected, angiography can be used.<sup>9,20</sup> In cases of hemorrhage at inaccessible sites, angiography, in addition to locating blood vessels, can obstruct it through selective embolization.<sup>10</sup>

Computed tomography has been reported as the best method for the detection of a metallic foreign body.<sup>24</sup> Dry wood can present similar density in a CT scan as with the air, making their identification difficult (Figs. 4A, B).<sup>25,26</sup> These authors suggest the use of a magnetic nuclear resonance scan, but it should be avoided when there is suspicion of metallic foreign body because it can lead to mobilization of metallic structure due to the magnetic field. Specht et al<sup>25</sup> reported a case of a boy with a history of trauma involving an organic foreign body, but surgical exploration and CT scan were negative. The CT scan showed a finding compatible with the air suggesting orbital emphysema. The patient's condition worsened and became evident through examination of magnetic nuclear resonance, noting the presence of organic foreign body orbit, requiring a new surgical approach for its removal. In this work, 6 cases were involved with the wooden rod; however, the plain radiographic examinations and CT scans were enough to plan the treatment because, in all cases, the wooden foreign bodies were partially outside the path of insertion.

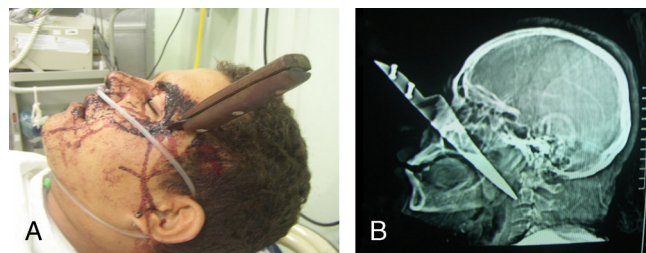
In the last years, many authors have been indicating the use of navigation systems for foreign bodies in the facial region, especially when it is implied to be a danger for important anatomic structures' failure of previous attempts at the removal of the foreign body, the presence of multiple foreign bodies, and the desire to achieve a minimally invasive access and to allow a quicker operation.<sup>3,13,27</sup> The referred method was used on case 5, due to the foreign body, difficult location, and intraoral approach. In case 13, surgical video assistance was used for a careful removal of the foreign body.

The treatment should initially prioritize the patient's stabilization with evaluation and maintenance of the upper airways, followed by hemodynamic control and neurologic evaluation.<sup>11</sup> Only after this treatment should the foreign body be carefully removed, preferably under general anesthesia.<sup>7,9,10,16,18</sup> When the impacted object is superficially confirmed by imaging examinations and it is not near any major vessel, the removal under local anesthesia can be performed as we have carried out in 5 cases.

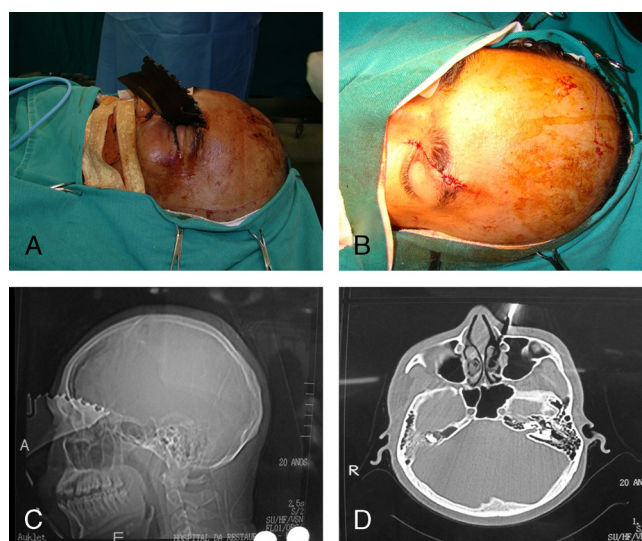
**TABLE 1.** Results of Collected Data From Patients

Case	Age, y	Sex	Race	Etiology	Fracture	Localization	Day
1	55	M	White	Accident in fishing	No	Nose	Saturday, daytime
2	20	M	White	Accident with rifle	Yes	Anterior cortical of frontal sinus	Sunday, daytime
3	31	M	White	Accident with rifle	Yes	Right zygomatic	Thursday, daytime
4	15	M	White	Accident with rifle	No	Right orbit	Wednesday, nighttime
5	41	M	White	Accident with chainsaw	No	Right infratemporal space and coronoid	Tuesday, daytime
6	12	M	White	Fall	Yes	Right orbit floor	Sunday, daytime
7	37	M	White	Physical aggression	No	Right orbit	Wednesday, nighttime
8	37	M	Black	Physical aggression	No	Right orbit	Monday, daytime
9	4	F	White	Object in mouth	No	Mouth floor	Monday, daytime
10	34	M	Black	Physical aggression	Yes	Left zygomatic and maxilla	Sunday, nighttime
11	22	M	White	Physical aggression	Yes	Left maxilla and palate	Saturday, nighttime
12	41	M	White	Accident with tile saw	Yes	Anterior cortical of frontal sinus	Tuesday, daytime
13	35	M	White	Motorcycle accident	Yes	Left orbital and sphenoid	Sunday, nighttime
14	16	M	White	Physical aggression	Yes	Left temporal mastoid	Friday, daytime
15	15	M	Black	Fall	Yes	Middle maxilla and palate	Saturday, nighttime
16	13	M	Black	Fall	No	Tongue	Saturday, daytime
17	31	M	Black	Physical aggression	Yes	Right orbit	Saturday, nighttime
18	26	F	White	Physical aggression	Yes	Left zygomatic	Tuesday, daytime
19	51	M	White	Fall	Yes	Right orbit	Wednesday, daytime
20	24	M	White	Accident with rifle	No	Left orbit	Wednesday, nighttime

The wound should be explored, followed by hemostasis, copious irrigation with saline solution and suture for planes.<sup>16</sup> It is advisable to prescribe antibiotics before and after surgery, as well as tetanus prophylaxis.<sup>7,9,16–18</sup> With exception of 6 cases, the foreign body was carefully withdrawn, without difficulty, back along the path of insertion. All the necessary measures for the treatment of the wound were taken, as well as antibiotic therapy and tetanus prophylaxis. Other approaches could be used for assisting the removal of the foreign body, such as coronal approach in 4 cases.



**FIGURE 1.** A, Jael syndrome. B, Computed tomographic scan: profile view.



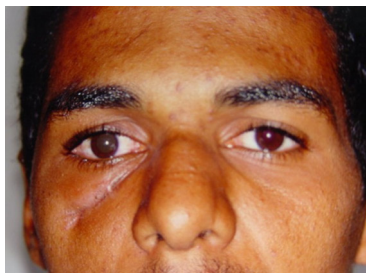
**FIGURE 2.** A, Lateral view of the impacted foreign body. B, Removal of the foreign body in the same path of insertion. C, Computed tomographic scan: profile view. D, Computed tomographic scan: axial view.



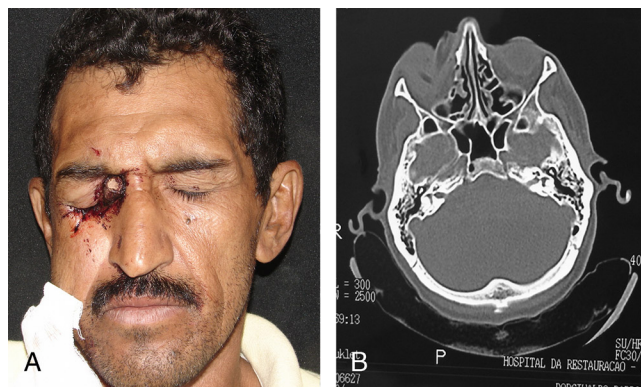
Object Type	Signal and Symptoms	Imaging Examination	Anesthesia Type	Approach	Intraoperative Complication	Hospital Discharge	Death
Fishhook	Pain	PA radiography of the skull	Local	Same path of insertion	No	2 d	No
Fragment from rifle	Pain, headache	PA, lateral radiography of the skull, CT	General	Coronal	No	2 d	No
Fragment from rifle	Pain, amaurosis	PA, lateral radiography of the skull	General	Same path of insertion	No	2 d	No
Fragment from rifle	Pain, amaurosis	CT	General	Same path of insertion	No	Other day	No
Fragment from chain	Pain, trismus	PA, lateral radiography of the skull	General	Intraoral	No	Other day	No
Wooden rod	Pain, ophthalmoplegia	CT	General	Same path of insertion	No	Other day	No
Wooden rod	Pain, amaurosis	CT	General	Same path of insertion	No	Other day	No
Wooden rod	Pain, ophthalmoplegia	CT	General	Same path of insertion	No	Other day	No
Metallic jewel	Pain	PA, lateral radiography of the skull	Local	Same path of insertion	No	Other day	No
Knife	Pain, trismus	PA, lateral radiography of the skull, CT	General	Same path of insertion	No	2 d	No
Knife	Pain	PA, lateral radiography of the skull	General	Same path of insertion	No	Other day	No
Tile saw	Pain, brain injury	PA, lateral radiography of the skull, CT	General	Same path of insertion + coronal	No	2 d	No
Motorcycle guidon	Brain injury	PA, lateral radiography of the skull, CT	General	Same path of insertion + coronal	Bleeding	—	Yes
Iron rod	Brain injury	PA, lateral radiography of the skull, CT	General	Same path of insertion + coronal	Bleeding	—	Yes
Iron rod	Pain, inability to close mouth	PA, lateral radiography of the skull	Local	Same path of insertion	No	Same day	No
Wooden rod	Pain	PA, lateral radiography of the skull	Local	Same path of insertion	No	Same day	No
Wooden rod	Pain, amaurosis	PA, lateral radiography of the skull	General	Same path of insertion	No	Other day	No
Projectile of firearm	Pain, epistaxis	PA, lateral radiography of the skull	Local	Same path of insertion	No	Same day	No
Wooden rod	Pain	CT	General	Same path of insertion + infraorbital	No	Same day	No
Fragment from rifle	Pain, amaurosis	CT	General	Same path of insertion	No	Other day	No

The orbit provides access vulnerable to the cranial cavity owing to a penetrating trauma, which can lead to meningeal and central nervous system involvement. Penetrating trauma in the cranio-orbital region has a mortality rate much higher than other types of trauma.<sup>28</sup> It was observed in case 13, where the patient had brain injury and a bleeding complication with a foreign body

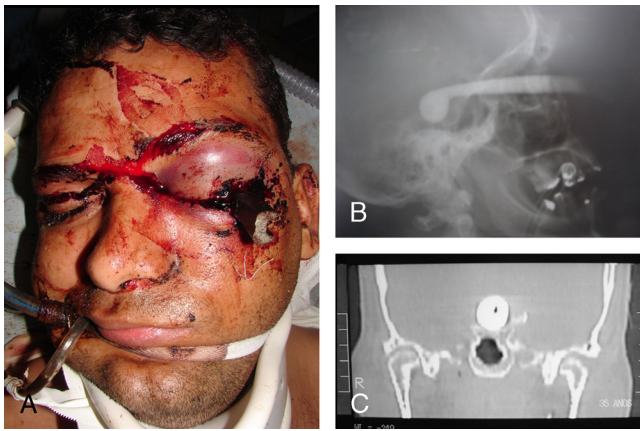
that entered the orbital region (Figs. 5A–C). In general, the 18 cases without death had a short period from surgery to hospital discharge.



**FIGURE 3.** Amaurosis can be noticed by the absence of miosis by light exposure of the right eyeball.



**FIGURE 4.** A, Wooden rod in the right orbit. B, Computed tomographic scan: axial view.



**FIGURE 5.** A, Foreign body in the left orbit. B, Radiograph of the skull: lateral view. C, Computed tomographic scan: coronal view showing the object in sella turcica region.

Injuries in the maxillofacial region due to foreign bodies can place the patient's life at risk, so a detailed diagnosis and a correct initial treatment performed by a multidisciplinary team increases the survival of this kind of patient.

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