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Cocaine is an alkaloid extracted from the *Erythroxylon* plant that grows in some countries of South America and Africa. Cocaine hydrochloride is made by dissolving cocaine alkaloid in hydrochloric acid to produce a water-soluble salt that can be dissolved in water and injected, inhaled, or snorted through the nasal mucosa.

Snorting cocaine causes necrosis of the nasal cartilage and nasal septum, perforation of the septum, rhinitis, nose bleeding, an impaired sense of smell, and foul breath. Cocaine anesthetizes the mucosa of the mouth and throat. Thus, cocaine smokers are not aware that the hot vapors and other impurities that they inhale burn the tissues of the oropharynx and tracheobronchial tree.1

In addition, users of cocaine may rub the drug on the gingival tissue because of the similarity of the mucosal architecture, and abundant vascularity between nasal and oral mucosa.2 Kapila and Kashani3 reported a gingival recession and dental erosion associated with local application of cocaine; the intense vasoconstrictive effect of cocaine use has been deemed responsible for these effects.4,5 Thus, the aim of this case report is to describe an unusual onlay bone graft necrosis associated with local application of cocaine.

**CASE REPORT**

**Patient**

A male patient, aged 27 years, presented with a missing upper central incisor with deficient buccal/palatal dimension and solicited dental implant treatment. The central incisor had been extracted 1 year before as a result of a fractured root (inadequate post design). The patient was healthy and without any significant medical history.

**Onlay Bone Graft**

The bone augmentation was performed as an outpatient procedure, with the patient under local anesthesia. The oral mucosa of the recipient implant site was incised palatally to the defect in the alveolar ridge. A full-thickness flap was elevated to expose the maxillary defect. The autogenous bone graft was obtained from the chin. According to the required quantity of bone, a corticocancellous block was outlined with a fissure bur assembled on a straight handpiece, under abundant irrigation with saline solution. The lingual cortex was preserved, and a collagen sponge, used as a hemostatic dressing, was placed in the donor area. The wound was closed with multilayered sutures following bone graft fixation. The corticocancellous bone block was stored in saline solution until fixing at the recipient site.

The buccal cortex of the recipient site of the edentulous area was accurately débrided from any soft tissue left during flap elevation, and the cortex was perforated with a round bur to increase bleeding of the recipient bed for the graft. The bone block, which was also perforated, was then fixed in the area with a small-diameter titanium alloy screw. Small gaps between the bone graft and the alveolar crest were filled with cancellous bone from the bone trap. The peristome at the base of the flap was carefully incised to allow stretching of the mucosa and tension-free adaptation of the wound margins. A removable, soft tissue-supported prosthesis was generously adjusted and relined with tissue conditioner. The patient was instructed to use his prosthesis for cosmetic purposes rather than for function.
Maintenance Phase

During the first postoperative month, clinical complications were not observed, and the prosthesis was relined with tissue conditioner again. The patient returned during the third postoperative month, reporting exposure of the bone graft (Fig. 1A). During the clinical examination, it was observed that the bone graft was totally exposed in the oral cavity, although the patient did not have pain or any other complication. The bone block was partially rotated to the occlusal aspect and presented some mobility. With the patient under local anesthesia, the titanium alloy screw was removed, and the bone block was stored in 4% neutral formalin until processing. Following bone graft removal, the implant bed was cleaned with gauze soaked in 0.12% chlorhexidine (Fig. 1B).

The patient was asked about the possible reasons for the cause of bone graft failure, such as late infection or compression from the temporary soft tissue-supported prosthesis. However, after a long conversation, the patient related the use of cocaine rubbing on the gingival tissue that covered the bone graft. The patient did not report how many times he had used the drug on the mucosa or why he chose this area. In addition, the information about the drug use was omitted by the patient from his dental medical history.

Histologic Processing and Evaluation

The bone block was harvested, fixed in formalin, and decalcified in Morse solution. Following decalcification, routine histologic processing and paraffin embedding were performed, and 5-μm thick tissue blocks were obtained with a longitudinal plane. The sections were stained with hematoxylin and eosin.

The bone fragment was filled with a necrotic tissue (Fig. 2A). Bone tissue presented parallel lamellae and ample spaces, which were sometimes empty or filled with necrotic tissue (Fig. 2B).

DISCUSSION

The procedure of guided bone regeneration (GBR) has been described as a predictable treatment for the regeneration of lost tissues. Nevertheless, some failures have been reported. Factors such as bone graft stability, size of the bone graft, peripheral sealing between bone graft and recipient bone, blood supply, and access to bone forming cells have been noted to be critical for a successful outcome. In addition, factors inherent to the patient, such as smoking and systemic health, as well as local conditions (e.g., provisional restoration, tension of the mucoperiosteal flap) are also crucial to predictability of the GBR. Fig. 1 shows the presence of sharp edges on the donor bone. However, we cannot confirm that these edges were left in the donor bone before that bone graft exposure. In addition, the bone graft had a slight movement in an occlusal direction, probably a result of mobility after bone graft exposure. It may be speculated that there were other mitigating factors, such as poor fit of the donor bone, failure to stabilize the donor bone, sharp edges left on the donor bone, and the lack of vascular channels that may jeopardize the GBR. However, we cannot confirm the exact cause of GBR failure. The cocaine probably potentiated the association of the failure of GBR. In addition, the patient himself admitted to using cocaine on the bone graft site.

In this report, an unusual bone graft failure caused by the use of cocaine on the autogenous bone graft is presented. The alveolar mucosa under the exposed bone graft showed an aspect of clinical inflammation. Necrosis and ulceration of mucosal tissue interfaces of the nose from contact with snorted cocaine have also been noted. Some investigators have reported desquamations, ulcerations,
and necrosis of the areas where cocaine was rubbed. In this case, histologic examinations of the exposed bone graft revealed severe superficial necrosis consistent with ischemic necrosis, which was in agreement with a previous report. Following bone block removal, the patient was referred to a local center that provides medical and psychologic treatment for drug users, before initiating new GBR for further dental implant placement. In addition, the use of gingival and alveolar mucosa as transport sites for cocaine administration appears to be fairly common. In conclusion, dental practitioners need to be aware of this phenomenon to recognize it because such patients often do not report the use of drugs, particularly cocaine.

Disclosure
The authors claim to have no financial interest in any company or any of the products mentioned in this article.

REFERENCES

Reprint requests and correspondence to:
Jamil Awad Shibli, DDS, MS, PhD
Universidade Guarulhos
Centro de Pós-Graduação Pesquisa e Extensão-CEPPE
Praça Tereza Cristina 1-Centro
07023-070 Guarulhos, SP, Brazil
Fax: +55-11-6464-1758
E-mail: jshibli@ung.br

Abstract Translations [German, Spanish, Portuguese, Japanese]

AUTOR(EN): Jamil Awad Shibli, DDS, MS, PhD*, Elcio Marcantonio, DDS, MS, PhD**, Luis Carlos Spolidorio, DDS, MS, PhD***, Elcio Marcantonio, Jr, DDS, MS, PhD****.


SCHLÜSSELWÖRTER: Autogenes Knochenspanplastik, Kokain, Zahnimplantate, geleitete Knochenspanregeneration / Versagen der geleiteten Knochenspanregenerationsbehandlung.
La asociación de la cocaína con la falla de un injerto de hueso en la incrustación con recubrimiento: Informe clínico e histológico

ABSTRACTO: Este informe del paciente presenta una falla inusual de un injerto de hueso en la incrustación con recubrimiento luego de la aplicación local de cocaína. Tres meses después del procedimiento de injerto de hueso, realizado en el maxilar anterior para aumentar el volumen del hueso, el injerto de hueso fue totalmente expuesto en la cavidad oral debido al contacto de la cocaína con el tejido gingival que cubría al injerto de hueso. Una vista histológica del fragmento del hueso removido presentó no solamente un área de necrosis, sino también amplios espacios llenados con material de necrosis y áreas de reabsorción. Los profesionales dentales necesitan estar al tanto de este fenómeno, ya que dichos pacientes a menudo no informan el uso de drogas, la cocaína en particular.

PALABRAS CLAVES: injerto autógeno del hueso, cocaína, implantes dentales, falla/ regeneración del hueso guiado

Falha no Enxerto Ósseo Onlay Associado a Cocaína: Relato Clínico e Histológico

RESUMO: O relato do paciente apresenta uma falha incomum no enxerto ósseo onlay após aplicação local de cocaína. Três meses após o procedimento de enxerto ósseo, realizado na maxila anterior para aumento do volume ósseo, o enxerto ósseo foi totalmente exposto na cavidade oral devido à esfregadura de cocaína no tecido gingival que cobria o enxerto ósseo. Uma visão histológica do fragmento ósseo removido apresentou não só uma região de necrose, mas também amplos espaços cheios de material de necrose e regiões de reabsorção. Os dentistas em exercício precisam ter consciência desse fenômeno, já que esses pacientes frequentemente não relatam o uso de drogas, particularmente cocaína.

PALAVRAS-CHAVE: enxerto ósseo autógeno, cocaína, implantes dentários, regeneração/falha guiada de osso

コカインとオンレイ骨移植の失敗の関係：臨床ならびに組織学的報告

著者：ジャミル・エリアド・シブリ，DDS，MS，PhD*，エルシオ・マフカントニオ، DDS，MS，PhD**，ルイス・カルロス・ススポリドリオ，DDS，MS，PhD***，エルシオ・マフカントニオ Jr., DDS, MS, PhD****

目的：この患者報告は、コカインの局所使用後に起こったためずらしいオンレイ骨移植失敗について論じる。骨移植増大のため行われた上顎前部の骨移植処置において、骨移植を覆う歯肉組織へのコカインのすり込みのために3ヶ月後に骨移植の口腔内完全露出が起こった。骨片除去後の組織学的検査では、壊死部分とともに壊死組織と新芽形成からなる大きな空間が観察された。患者がそのドラッグ使用、特にコカインの使用を医者に報告しないことは多くあり、歯科医はこのような現象についてよく注意することが必要である。

キーワード：自家骨移植、コカイン、テントルインプラン、誘導骨再生／失敗

*ダブリジオス大学歯科研究学部歯周病学科助教授（ブラジル、SP、ダブリジオス)
**サンパウロ州立大学（UNESP）テントル・スクール・オブ・アラクラアラ病理生理学部准教授（ブラジル、SP、アラクラアラ）
***サンパウロ州立大学（UNESP）テントル・スクール・オブ・アラクラアラ病理生理学部准教授（ブラジル、SP、アラクラアラ）
****サンパウロ州立大学（UNESP）テントル・スクール・オブ・アラクラアラ病理生理学部准教授（ブラジル、SP、アラクラアラ）
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