Hemorrhage Related to Implant Placement in the Anterior Mandible

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Implant placement in the edentulous anterior mandible is relatively considered a routine and safe procedure. The interforaminal area is the usual area in the mandible for implant placement for the support and retention of a fixed partial denture or removable overdenture. This region is also the usual donor site of bone grafts. However, implant placement, like any other surgical procedure, is not free of risks and complications. The purpose of this review article was to investigate the risk of a life threatening hemorrhage due to arterial injury at implant placement in the anterior mandible. (Implant Dent 2011;20:e33–e37)

Key Words: hemorrhage, anterior mandible, implant, complication

In edentulous patients, implant placement in the anterior mandible has been performed commonly for the stability and maintenance of complete dentures. In such cases, most implants are placed in the space between the 2 mental foramens, and this area has been relatively recognized to be safe for implant placement without serious complications. In addition, the superior and inferior cortical plates of this area provide advantages for the stability of implants.[1]

However, serious complications may develop even with implant placement in the interforaminal area. Numerous studies have reported on life-threatening complications caused by implants.[2–7] Among them, hematoma in the sublingual space that develops during implant placement in the anterior mandible is a rare but serious complication that may be fatal.[2–5,8–10] Hemorrhage occurring during implant placement is caused by the perforation of the lingual plate and the damage of the peripheral branch of adjacent artery. This hemorrhage spreads to the sublingual space and the loose tissues between lingual muscles and may occur as immediate or delayed hemorrhage. The edema that develops at that time elevates the tongue and induces the obstruction of the upper airways, and an emergency airway management may be required.

Several authors[11–14] have studied the blood supply to the floor of mouth, the interforaminal area, and the mentum using computed tomography (CT) and cadavers, and it has been reported that the blood vessels are the terminal branch of the sublingual artery and submental artery that penetrate the lingual cortical plate of the anterior mandible.

The bleeding complication associated with implant placement can occur at the maxilla and in the mandible. The risk of bleeding followed by an injury of the branch of the maxillary artery during sinus graft procedures was reported by Lee[15] and Flanagan.[16]

This study was conducted to examine the hemorrhagic complications that may develop during implant placement in the anterior mandible and to evaluate the risks. And the management following hemorrhage will be reviewed.

MATERIALS AND METHODS

This study was a review of the literature of hemorrhages associated with placement of implants. The literature was collected by an Internet search, and the keywords for the search were "implant," "bleeding," "complication," and "hematoma." The studies were not limited to those from specific journals, and the studies of implant complications published within the past 15 years were reviewed primarily. In addition, studies of placement of implants in the maxilla and posterior mandible were excluded from this study.

RESULTS

Causes of Hemorrhage—Anatomical Review

It is without a doubt that hemorrhages are caused by the damage of blood vessels. In addition, it is widely accepted that the sublingual artery, which is a branch of the lingual artery, is the main supply artery to the floor of mouth. It has been also revealed that the submental artery also plays an important role in the blood supply to the floor of mouth.[11,12,17] The terminal branches of these submental artery and the sublingual artery run toward the lingual side of the anterior mandible in parallel to the genioglossus muscle, and anastomose during running (Fig. 1).[6] The terminal branch of the sublingual artery pene-

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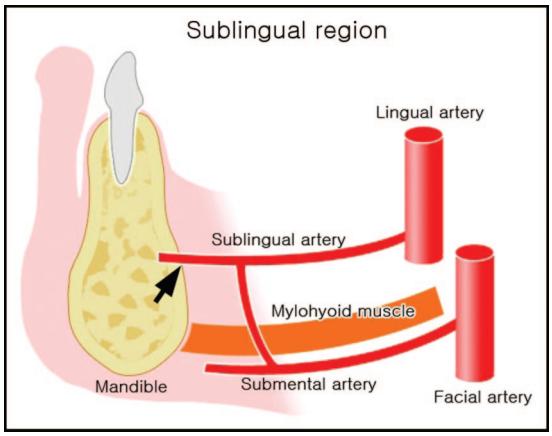

Fig. 1. The anatomical features of the sublingual and submental arteries in the sublingual region. The arrow indicates the perforation of the lingual artery that can cause fatal bleeding complications during the placement of implants.

trates the lingual cortical bone and reaches the inside of the mandible in some cases. In studies of dried cranium and studies using CT scan, the perforated arteries in the lingual plate of anterior mandible was observed in 80% and 60%, respectively.[18]

If the lingual cortical bone is perforated during implant placement, as shown in Fig. 1, the sublingual artery may be injured, and although rare, it may be a cause of life-threatening hemorrhage.[6] In addition to an injury in the sublingual artery, tearing of the periosteum caused by the lift of periosteal flap may also be a cause of severe hemorrhage. Even when the mandibular lingual cortical bone is not perforated, the sublingual artery running within the bone may be injured, causing a hemorrhage. Once hemorrhage occurs, blood may spread into the connective tissues in the floor of mouth and the sublingual space, which may lift the tongue and result in the obstruction of the upper airways. This may become an emergency situation requiring endotracheal intubation or emergency tracheostomy. It has been reported that the possibility of such a hemorrhage is increased in patients who have been taking anticoagulants for a long time.[19,20]

Hemorrhage Management

When a blood vessel is injured during implant placement, first, the dentist should evaluate the airway. The endotracheal intubation or tracheostomy may be required in some cases. Once the airway is secured, the next task is hemostasis. Hemorrhage could be managed by the insertion of gauzes,[5,21] application of hemostatic agents,[5,8] electric cauterization,[9] or finger compression methods.[2,8,19] Artery ligation could be one of the methods for hemostasis. But, drain insertion for the purpose of reducing the pressure could prevent hemostasis.[22] In a serious hemorrhage, vascular angiography may be of help to find the hemorrhage site.[23]

DISCUSSION

This study confirms the potential risk of implant placement in the anterior mandible. In edentulous patients in particular with severe resorption of the alveolar bone, the possibility of injury due to lingual perforation of blood vessels would be increased. It has been confirmed by several studies that injury of the lingual periosteum or the rupture of the sublingual artery during implant placement may induce continuous hemorrhage, and the hemorrhage could form a large hematoma in the floor of mouth without particular resistance.[20,22] In addition, such a hematoma could be indurated at neck palpation. For the spread pattern, the clinical characteristics are similar to the infection pathway, and the spread is rapid, resulting in the obstruction of the upper airway such as Ludwig's angina. For the treatment of hemorrhage, endotracheal intubation for securing the airway, tracheostomy, hemostasis with hemostatic agents, arterial ligation, compression, and other procedures were performed.[1–5,8–10]

If implant placement in the anterior mandible is planned, dentists should perform presurgical evaluation by CT, etc., to determine the presence or absence of the lingual perforation artery and its location. It has already been established as one of the most effective presurgical diagnostic methods in dental implant placement.[24]

Longoni *et al*[18] have reported that in studies of dried skulls and CT images, at least 1 lingual perforation artery was observed in 80% and 60%, respectively, and the number ranged from 1 to 4. In addition, the lingual perforation artery was observed in the median area of the mandible in ~51% of the entire dry skulls, and similarly, on CT images, the perforation artery was observed in the median area of mandible in ~55%.

During placement of implant in the anterior mandible, a serious hemorrhage rarely occurs. But, when it does occur, surgeons should make efforts to secure the airway and perform hemostasis immediately.

CONCLUSION

As shown in this study, numerous investigators have reported that placement of implant in the anterior mandible are not as safe as we believe. During implant placement in the anterior mandible, especially in the median area, special attention should be paid on the lingual perforation branch of the sublingual artery, and for this, it is essential to conduct clinical examination including CT.

Disclosure

The authors claim to have no financial interest, directly or indirectly, in any company or product mentioned in this article.

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ID Abstract Translations

GERMAN / DEUTSCH

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Blutungskomplikationen bei Implantatsetzung im vorderen Unterkiefer

ZUSAMMENFASSUNG: Die Einpflanzung von Implantaten im zahnlosen vorderen Unterkiefer wird als relativer Routineeingriff mit großer Sicherheit angesehen. Die Interforaminalregion ist der Bereich, in dem normalerweise im Unterkiefer eine Transplantierung durchgeführt wird, um damit eine feste Teilprothese oder herausnehmbare Prothese zu stützen und zu halten. Auch wird in diesem Bereich normalerweise die Entnahme von Spendergewebe durchgeführt, falls eine Transplantierung vorgenommen werden soll. Jedoch ist eine Implantierung wie jeder andere chirurgische Eingriff nicht ohne Risiken und mögliche Komplikationen. Der vorliegende Überblicksartikel zielte darauf ab, das Risiko einer lebensbedrohlichen Blutung aufgrund Arterienverletzung bei Implantierung im vorderen Unterkiefer zu untersuchen.

SCHLÜSSELWÖRTER: Blutung, vorderer Unterkiefer, Implantat, Komplikation

SPANISH / ESPAÑOL

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Complicación de sangrado relacionada con la colocación del implante en la mandíbula anterior

ABSTRACTO: La colocación del implante en la mandíbula anterior sin dientes se considera un procedimiento relativamente seguro y rutinario. La región interforaminal es el lugar usual de la mandíbula donde se coloca el implante para ofrecer el apoyo y retención de una dentadura parcial fija o sobredentadura removible. Esta región también es el lugar usual de donación para los injertos de hueso. Sin embargo, la colocación del implante, como cualquier otro procedimiento quirúrgico, no está libre de riesgos y complicaciones. El propósito de este trabajo es investigar el riesgo de una hemorragia que ponga en peligro la vida debido a una lesión arterial en la colocación del implante en la mandíbula anterior.

PALABRAS CLAVES: hemorragia, mandíbula anterior, implante, complicación

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Complicação de Sangramento Relacionada à Colocação de Implante na Mandíbula Anterior

RESUMO: A colocação de implante na mandíbula anterior desdentada é considerada um procedimento relativamente rotineiro e seguro. A área interforaminal é a área usual na mandíbula para colocação de implante para o suporte e retenção de uma dentadura parcial fixa ou sobredentadura removível. Essa região também é a área doadora usual de enxertos ósseos. Contudo, a colocação de implante, como qualquer outro procedimento cirúrgico, não é isenta de riscos e complicações. O propósito deste artigo de revisão era investigar o risco de uma hemorragia ameaçadora da vida devido a lesão arterial na colocação de implante na mandíbula anterior.

PALAVRAS-CHAVE: hemorragia, mandíbula anterior, implante, complicação

RUSSIAN / РУССКИЙ

АВТОРЫ: Ji-Ho Jo, доктор хирургической стоматологии, Su-Gwan Kim, доктор хирургической стоматологии, доктор философии, Ji-Su Oh, доктор хирургической стоматологии, магистр естественных наук в области стоматологии

Кровотечение как осложнение, связанное с установкой имплантата в дистальный отдел нижней челюсти

РЕЗЮМЕ. Установка имплантата в дистальный отдел адентичной нижней челюсти считается относительно стандартной и безопасной процедурой. Имплантаты для обеспечения опоры и фиксации несъемного частичного зубного протеза или съемного протеза обычно устанавливаются между подбородочными отверстиями нижней челюсти. Из этой же области обычно берут материал для костных трансплантатов. Однако установка имплантата, как и любая другая хирургическая процедура, не исключает наличия рисков и возникновения осложнений. Цель данной обзорной статьи — изучить риск возникновения угрожающего жизни кровотечения из-за повреждения артерии при установке имплантата в дистальный отдел нижней челюсти.

КЛЮЧЕВЫЕ СЛОВА: кровотечение, дистальный отдел нижней челюсти, имплантат, осложнение

TURKISH / TÜRKÇE

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Anterior Alt Çenede İmplant Yerleştirme ile Bağlantılı Kanama Komplikasyonu

ÖZET: Dişsiz anterior alt çenede implant yerleştirme, rutin ve güvenli bir işlem olarak kabul edilir. Sabit bir kısmi protezin ya da hareketli bir diş üstü protezin desteklenmesi ve tutturulması için implant yerleştirmede genellikle interforaminal alan kullanılır. Bu bölge aynı zamanda genelde kemik greftleri için kullanılan donör yeridir. Ancak, başka herhangi bir cerrahi işlemi için söz konusu olduğu gibi, implant yerleştirme risksiz ve komplikasyonsuz bir işlem değildir. Bu inceleme yazısının amacı, anterior alt çenede arteryel yaralanma nedeniyle yaşamı tehdit eden kanama riskini araştırmaktı.

ANAHTAR KELİMELER: kanama, anterior alt çene, implant, komplikasyon

JAPANESE / 日本語

下顎前歯部インプラント埋入術に伴う出血合併症

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研究概要:
下顎前歯部の無歯部位にインプラント埋入術をおこなうことは比較的型通りで、しかも安全な処置と見なされている。下顎孔間は固定式部分床義歯、あるいは取外し式オーバーデンチャーの支台また維持装置用インプラントの一般的な埋入部位である。またこの部位は骨移植に広く利用されるドナーサイトでもある。ただしインプラント埋入手術はその他あらゆる外科手術同様、危険性や合併症が皆無というわけではない。当文献再評価は下顎前歯部インプラント埋入手術の際、動脈損傷により生命を脅かす重篤な出血の危険性を調査した。

キーワード： 出血、下顎前歯部、インプラント、合併症

CHINESE / 中国語

與前下頜植牙相關的出血併發症

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摘要：
在缺牙前下頜植牙是相當平常且安全的程序。常見下頜植牙區在兩頦孔間區域，可做為固定式局部義齒和活動式覆蓋義齒的支撐和固位。本區域也是常見的骨移植物捐贈部位。不過，和其他外科程序一樣，植牙並非沒有風險或併發症。本檢討報告旨在調查因前下頜植牙傷及動脈，導致發生危及生命的大出血之風險。

關鍵字：大出血、前上頜、植牙、併發症

KOREAN / 한국어

하악 전방의 임플란트 식립 관련 출혈 합병증

저자: Ji-Ho Jo, DDS, Su-Gwan Kim, DDS, PhD, Ji-Su Oh, DDS, MSD

요약:
하악 전방에의 임플란트 식립은 비교적 일상적이고 안전한 시술로 간주된다. 고정 부분 의치 또는 제거가능 중첩의치의 지지 및 유지를 위한 임플란트 식립에 보통 사용되는 하악 부위는 구멍간 부위(interforaminal area)이다. 이 부위는 또한 골 이식재로 사용되는 부위이기도 하다. 그러나 다른 모든 외과시술과 마찬가지로 임플란트 식립 역시 위험도와 합병증에서 자유롭지 못하다. 본 검토문헌의 목적은 하악 전방에서 임플란트 식립시 동맥손상으로 인한 생명을 위협하는 출혈 위험성을 연구하기 위함이었다.

키워드: 출혈,하악전방, 임플란트, 합병증