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Association of  
Dental  
Implantologists

## Guidelines

### Avoiding Treatment Errors – Managing Surgical Complications

Developed by consensus of the 5<sup>th</sup> European Consensus Conference (EuCC)  
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#### Protocol

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#### 1. Introduction

The insertion of dental implants is considered a safe surgical procedure. However, surgical complications can involve sensible neighbouring structures mostly in complex anatomical situations and/or limited bony support. Adequate prosthetic treatment requires sufficient presurgical planning under functional aspects. Biological and mechanical limitations have to be considered. Complications associated with grafting materials may increase anatomical defects.

The purpose of this consensus is to lay down strategies to avoid the most severe surgical injuries and to propose measures for their complication management.

#### Nervus alveolaris inferior

Injuries of the nervus alveolaris inferior (NAI) render clinically in paraesthesia, hypaesthesia, dysaesthesia or anaesthesia in the corresponding area of sensation. Compression, laceration or transection of the nerve can occur by preparation of the implant bed, insertion of implants, use of biomaterials or preparation of the muco-periosteal flap.

If perturbation of sensitivity is manifest after implant insertion and there is no evidence of any direct injury a three-dimensional radiological scan should be applied to determine the position of the nerve relatively to the implants placed in order to rule out a compression of the nerve through the surgical procedure. If a compression of the nerve by the implant can be determined the pressure should be relieved as soon as possible.

In case of a full transection of the nerve, collegial advice should be considered for immediate nerve rehabilitation. If sensitivity is reduced diagnosis should be achieved by a specialist to discuss further treatment options (e.g. nerve reconstruction) [1].



To avoid injuries of the NAI sufficient preoperative imaging is required. A panoramic image can be sufficient for simple cases, however, for complex cases cross-sectional or 3D imaging is recommended [2].

Implant planning based on two-dimensional imaging should respect a minimum distance of 2 mm from implant to the NAI [3, 4]. When using drilling templates system specific tolerances especially at the apical end of the implant must be observed [5].

#### Nervus mentalis

To avoid injuries of the nervus mentalis careful preparation and avoiding of compression when raising a muco-periosteal flap is advised.

#### Floor of the mouth (Nervus lingualis, Arteria sublingualis, Arteria submental, Wharton's duct)

Injuries of the floor of the mouth are frequently provoked by preparation of soft tissues on the lingual side of the mandible, especially when undercuts are present. Relevant structures at risk are arteriae submentalis and sublingualis, which when severely bleeding can cause swelling of the floor of the mouth leading to possible airway obstruction. Moreover, the lingual nerve can be injured which runs in 15 % of cases at the crestal level of the mandible or even higher in the proximity of the third molars [4].

If hemorrhage develops in the floor of the mouth electrocoagulation or ligation of the bleeding vessel should be applied. Anaesthetics containing epinephrin can be directly applied into the soft tissue, however, rebound bleeding should be considered as well as the general medical condition of the patient. Bleeding can also be controlled by firm pressure with gauze. If bleeding persists, hospital emergency care is necessary since the patient may require aggressive medical and surgical management.

To avoid injuries in the floor of the mouth, comprehensive preoperative planning should be performed, especially to assess the bucco-lingual space of the mandible and to avoid perforation of the lingual cortical plate. This can be achieved by careful clinical examination and proper radiographs.

Vertical cutting into the lingual aspect of the mandible should be avoided.

#### Neighbouring teeth

Teeth next to the implant site can be damaged by direct mechanical trauma or through overheating the local bone by drilling the osteotomy. Reduction of the blood supply of an adjacent tooth can also lead to periapical pathology. Retrograde peri-implantitis can develop from an infected neighbouring tooth in 1 % of the cases [5, 6].

In order to avoid complications involving neighbouring teeth a safety distance of 1,5 mm is advised. The angulation of the neighbouring teeth must be considered. In situations of limited space 3D-imaging and computer-aided drill guides may be used to prevent injuries of neighbouring teeth.



### Maxillary sinus

Perforation of the Schneiderian membrane should be avoided during implant placement. Unintended perforation into the maxillary sinus frequently does not severely diminish implant survival as long as the implant does not penetrate the Schneiderian membrane. The latter applies for the mucosa of the floor of the nose. If primary stability is achieved antibiotic prophylaxis and nasal decongestants are required. If primary stability is not achieved the implant has to be removed before wound closure.

During sinus lift procedures the Schneiderian membrane is ruptured in about 25 – 40 % [7, 8]. It should be closed using adequate techniques. If this is not possible the surgeon must abandon the augmentation procedure and postpone it until regeneration occurs (approximately 3 months). Postoperatively adequate antibiotic prophylaxis should be continued.

If a sinusitis develops referral to a specialist is strongly advised [9, 10].

### Grafting materials

The indication for the use of biomaterials must be carefully considered to avoid additional complications.

### General statement

It is recommended that adequate training and education is achieved prior to starting implantological procedures and that all complications should be documented and audited.

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signed by

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