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Rejuvenating lives through maxillofacial implants: Review

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Abstract
Maxillofacial defects have been restored by surgery, prosthesis, or a combination. As the osseo integration concept was conceived and has subsequently developed, bone-anchored implant support for external prostheses or combination intra extra oral restorations has become a most viable treatment option. Treatment to date suggests that fewer implants may be needed to support craniofacial prostheses than thought initially.

Keywords: Maxillofacial prosthesis, defects, implants, aesthetics

Introduction
An esthetic and comfortable maxillofacial prosthesis alleviates patient's concerns and improves their quality of life. There has been a shift toward implant-retained maxillofacial prostheses over conventional prostheses. This narrative review addresses the current state of the treatment options and materials involved in the rehabilitation of maxillofacial defects. Possible treatment outcomes are reviewed, as is the impact of various treatments on the coping ability and quality of life of patients.

The location and orientation of extraoral implants is important to obtain an optimal prosthetic result. Pre-implant treatment planning is critical to coordinate the patient's surgical and prosthetic management because treatment planning should involve all members of the treatment rehabilitation team. An esthetic and comfortable maxillofacial prosthesis alleviates patients' concerns and improves their quality of life without the risks associated with surgery. Treatment of maxillofacial defects has evolved to incorporate a multidisciplinary approach with a combination of invasive and noninvasive treatment options. The treatment plan results from discussions between various members of the treatment team, including ablative surgeons, reconstructive surgeons, maxillofacial prosthodontists, and maxillofacial technicians. Maxillofacial prostheses can provide a natural-looking cosmetic situation. In many cases, the esthetic outcomes of maxillofacial prostheses are superior to those of surgical reconstruction. Implants are placed into the residual bone and then used for retention, support, and stability of prosthesis. Use of similar implants in extraoral sites is growing in popularity, especially for the retention of auricular prostheses and for bone – anchored hearing aids (BAHA). This review explores the current state of the treatment options and different materials involved in the rehabilitation of maxillofacial defects.

Indications for bone-anchored prostheses:
- The necessity of optimal tumor aftercare, e.g. in the case of a high risk of recurrence
- If local or general contraindications concerning procedures of reconstructive surgery exist (e.g. in the case of severely damaged skin following radiation)
- poor general condition,
- during individual stages in plastic reconstructive surgery (interim prosthesis),
- following failed reconstructive procedures,
- the rejection of reconstructive procedures on the part of the patient,
- High aesthetic demands.

Osseointegrated implants have greatly improved the success of prosthodontic rehabilitation by counteracting the destabilizing influence of the remaining tongue and muscles of mastication. The successful utilization of dental implants depends on many factors including the availability and position of sufficient good quality bone, arch shape, inter-arch space, occlusion, degree of mouth opening, un-irradiated tissues, plaque control, patient motivation and affordability [2]

Implant placement

Implant placement is guided by the design of prosthesis and the availabilitv of sound bone in and around the defect site. Implant placement is done at low speed and copious, cooling/ If possible implants should be placed a minimum of 15mm apart, this is important in minimizing adverse soft tissue reaction. For an auricular prosthesis implants are placed in post auricular region, [4] this area corresponds to location of helix and antihelix. Tjellstrom and Coworkers described this location as being 18 to 20mm from the center of external auditory meatus. However, this should be used only as a guide, and is of limited use in congenital anomalies. Implant placement may be limited by location of mastoid air cells.

For an orbital prosthesis, the implants are ideally placed around the defect, with in the orbital rim. [4] Because of bony anatomy, placement in often limited to the superior and lateral aspects of the rim. The implants should be placed within the confines of the defect and parallel or slightly inward in relation to the frontal plane, so as not to interfere with the ideal contours of prostheses. Access for surgical or prosthetic instrumentation with in the defect is a limiting factor. In extensive orbital defects, implants can be placed in zygoma / maxillae.

Implants to anchor a nasal prostheses can be placed in maxillae and frontal bones location of frontal sinuses and the superior margin of the prostheses are limiting factors in the placement of implant in the superior aspect of the defect. If implants are placed with in the inferior aspect of the defect care must be taken so that access is available for prosthetic instrumentation and retentive components. Success of implants placed in anterior nasal floor is higher than implants placed in glabella. [5]

For an auricular prosthesis usually two to three implants are placed with the positioner held in place in the patient, the ideal location are marked on it, then holes are drilled through the positioner at these locations. Later during surgery the positioner is used to transfer these locations to the patient to ensure that the implant are placed on the correct locations.

For an orbital/ nasal prosthesis the intaglio surface of the positioner is ground down so that its overall thickness in only 2 to 3mm. The margin are left intact so that the positioner can still be easily oriented on the patient. In case of an orbital prosthesis, three to five implants are placed. For nasal prosthesis two to four implants are used. Columella Of surgical positioner is a removed to permit easier viewing into the defect. The surgical positioner in also used to determine whether preprosthetic surgery is needed. In case of an auricular prosthesis soft tissue tags may interfere with ideal shape of prosthesis. Bony preprosthestic surgery is performed at the time of implant placement. Soft tissue modifications are usually done when the implants are uncovered.

If the implants can be distributed bilaterally, more acceptable forces will be generated to the implants and better retention and stability will be achieved. Soft palate defects are normally associated with bilateral maxillary support. The primary function of implants is to retain the prosthesis and to support the occlusion. Aids such as Tomograms, three dimensional scans and imagings and computer aided design, computer aided manufacturing of skeletal models may also be helpful to guide implant placement.

Discussion

Historically, the continuing loss of supporting structures left patients with increasing levels of physiologic and cosmetic deficiency. Compensation for unfavorable anatomy generally requires surgical alteration of the defect area, alternative methods of external fixation, mechanical engagement of tissue undercuts, or the use of denture or skin adhesives.

Mandibular discontinuity subsequent to ablative tumor surgery is effectively managed by immediate or delayed surgical reconstruction to re-establish continuity. Endosseous implants in this grafted bone will allow the placement of a dental prosthesis that does not create deleterious compressive forces on the graft. [6] The resected mandible that has not been reconstructed will have a deviated opening and closing arc. The angle of mandibular closure will place forces on the implants that are not in line with the long axis of the implants.

In hard and soft Palate defects, large obturator prostheses place substantial forces on the residual structures. When implants are used to retain such prostheses, it is essential that the different forces be considered. These prostheses have a tendency to rotate into the defect area when occlusal loads are placed on the defect side but to rotate out of the defect area as gravity exerts its pull on the prosthesis. [7] Endosseous implants in residual maxilla must be of sufficient number, length and distribution to resist the anticipated complex forces of mastication and dislodgment. Four implants in the intact maxilla has been suggested as the minimum number for support of overdenture prostheses. [8]

Osseointegrated implants applied for restoration of function, esthetics into cranial skeleton serves as boon for debilitated patients where conventional maxillofacial prostheses cannot be used for one or other reasons. The disadvantage due to eye glass frame, tapes adhesives, anatomic undercuts are overcome by tissue integrated prostheses which is more comfortable and acceptable by the patients. Even in cases where exact implant parallelism cannot be obtained due to anatomy of the defect or due to bone quality, prostheses can be fabricated by taking impression by multiple tray technique and good individual retentive system can be used such as ball and socket, magnets, rings and magnets, which while providing retention also creates space for hygiene maintenance.

Implant supported maxillofacial prostheses serves the debilitated patients, at the same time careful patients selection, pre surgical evaluation of both systemic status and bone quality at the implant site, along with the patients interest to perform daily home care, provide a successful result on long term basis. Not all patients are candidates for these procedures. Comprehensive diagnosis and precise evaluation of the patients needs followed by appropriate treatment planning provide the restorative dentist with the necessary tools to satisfy patients expectations. When all sequences of treatment are properly executed, the implant rehabilitation is a gratifying procedure for both the maxillofacial prosthodontists, surgeon and the patient. The application of osseointegrated fixture to the cranial skeleton for facial prostheses retention has made a revolutionary in search for perfect soft tissue replacement.

Conclusion

The head is arguably one of the most important anatomical regions of the human body, accommodating the brain, eyes, ears, nose, mouth and muscles of facial expression. Facial aesthetics is intricately related to ego, self-esteem and body image, thus defects of this region can have a very negative impact on a person's quality of life [1]. Surgical reconstruction is not always possible due to the size or location of the defect, the loss of vital anatomical structures, previous surgery or radiation therapy, non-healing, friable or cancerous surrounding tissues, or general debilitation of the patient. In these situations, prosthetic rehabilitation is the only alternative available to the patient. In cases in which an extraoral approach is available in the course of complex maxillofacial procedures, direct surgical access to the site of a zygomatic implant allows direct visualization and improved retraction and protection of nearby vulnerable structures. It may be used to facilitate the predictable treatment of the atrophic maxilla, reducing the need for graft surgery and shortening the treatment time.

The craniofacial region is highly visible and psyche-sensitive, thus deserving our best professional effort in reconstruction and rehabilitation. [1] The success of bone-anchored prostheses is based upon the patients' acceptance, contribution to quality of life, and use of the prostheses as a replacement prosthesis for either a developmental defect or acquired defect [2]. Reports regarding patients with congenital or developmental defects, and patients who lost lost their facial parts due to trauma, or tumor ablation show that, with the aid of a digitally designed surgical guide, the implants can be placed well in close proximity to the preoperatively planned positions. These positions are satisfactory from the surgical and prosthetic points of view to allow for optimal implant retained prostheses. [9, 10] Prosthesis weight and exposure to torquing forces affect the treatment decision. An exception is the irradiated orbit, in which additional implants may be required to offset the possible loss because of nonintegration. Extraoral implants have been used for many years to provide anchorage for silicone nasal prostheses, as an alternative to surgical reconstruction. Conventional dental implants are generally used in nasal reconstruction. However, access to the prosthetic platform for prosthetic reconstruction can be difficult because of the positioning of the implant head within the piriform aperture.

The design of specially engineered bifunctional implant with improved surgical and prosthetic handling characteristics can be placed via an intraoral approach. The implant is able to provide anchorage at both of its ends, making it possible to simultaneously stabilize nasal and dental prostheses. The bifunctional implant facilitate surgical and prosthetic management in many cases. The provision of a fixed implant-retained denture avoides the need for a removable prosthesis. The patients experience great benefit of fixed oral rehabilitation with maxillofacial implants. CAD/CAM technology offers the opportunity to produce small numbers of bespoke components at a low cost. The art and science of treating craniofacial defects has definitely been advanced in this osseointegration era. However, future treatment must be approached with care and caution in light of our lack of long-term experience and implant survival data.

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