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Review Article

Pre-prosthetic procedures in maxillofacial surgery: A review of literature

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ABSTRACT

Following natural tooth extraction, bone resorption initiates, particularly affecting the mandible more than the maxilla, with denture wear exacerbating this process. Nutritional deficiencies, systemic bone diseases like osteoporosis, and endocrine dysfunction can further accelerate bone loss. A comprehensive medical history and physical assessment are imperative prior to preprosthetic surgical intervention. Surgical intervention may be contraindicated in the presence of significant general illnesses. Special consideration should be given to laboratory tests assessing bone resorption extent. Success in removable prosthesis treatment hinges on the convergence of multiple factors, with one pivotal aspect being treatment success.

1. Introduction

Preprosthetic surgery, designed to expedite the manufacture of prosthetics or enhance prosthodontic care outcomes, includes procedures to address jaw tissue lesions or abnormalities for better prosthetic appliance fitting. Traditionally, this type of oral surgery involved tooth extraction and soft tissue modifications, such as smoothing out lumps, bumps, and sharp edges. In the last 15 years, there has been a resurgence of interest in preprosthetic surgery, leading to innovative procedures.

In 1853, Willard[1] was the first American dentist to remove interdental gingival papillae and alveolar borders after dental extractions, which allowed for the earlier creation of dentures. In 1876, Beers[2] recommended "excisions of alveolus after extraction of teeth" and provided detailed instructions on bone removal for cases of excessive alveolar prominence. The evolution of preprosthetic surgery from simple ridge trimming to comprehensive reconstructive procedures began when Kazanjian[3] introduced the prototype of labiobuccal vestibuloplasty treatments. These treatments aimed to create additional denture-bearing surfaces, thereby enhancing denture stability. This method was further refined by Godwin[4] in 1947, Clark[5] in 1953, and Obwegeser[6] in 1963, who incorporated the use of skin grafts. Most surgeries have focused on soft tissue adjustments to improve the comfort and fit of prosthetic devices.

2. Objectives

Preprosthetic surgery aims to create strong supporting structures for future prosthetic device placement. Ideal conditions for achieving optimal stability and support, with minimal functional interference, include nearly parallel bony walls without undercuts, resulting in broad, flat ridges with vertical heights of at least 5 mm. A sturdy mucosal layer, characterized by distinct buccal and lingual sulci and free of excess tissue folds or frenal scars, is essential. An interarch space of at least 16 to 18 mm is necessary to accommodate dentures. Restoring bone mass in severely deficient mandibles is crucial

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for protecting neurovascular bundles within dehisced mandibular canals. A desirable arched palatal vault and post-tuberosity (hamular) notching enhance the posterior border seal, resist anterior dislodgment forces, and protect against neoplastic conditions. Achieving these objectives in conventional prosthesis construction should allow for the wide distribution of functionally generated forces, reducing adverse soft tissue and bone alterations, and facilitating satisfactory function.

3. Discussion

Preprosthetic surgery is essential for preparing a fully or partially edentulous mouth for denture creation. This process includes various surgical interventions, ranging from simple dentoalveolar corrections to complex procedures such as vestibular lowering techniques, onlay and inlay augmentation, and implant placement. The primary objectives of preprosthetic surgery are to eliminate disease, preserve oral structures when possible, and provide optimal residual tissue to withstand masticatory pressures, maintain function, and preserve aesthetics for denture patients.

Tooth loss leads to gradual resorption of the alveolar ridge, creating a significant challenge for prosthetic replacement. Tallgren[7] (1972) described this typical resorption pattern, which reduces the denture-bearing area and results in a loss of stability and retention for prosthetics. The mandible experiences greater alveolar bone resorption compared to the maxilla. Additional challenges include bony undercuts, exostosis, tori, insufficient bone height and width, inadequate soft tissue support, and improper soft tissue attachment.

A comprehensive assessment and treatment plan are essential, involving a thorough review of the patient's medical history and current health status, with attention to allergies, medication reactions, bleeding tendencies, and systemic disorders that may impact surgery or anesthesia. Clinical examination of hard and soft tissues, radiographic surveys, and advanced imaging techniques like computed tomography help identify pathological lesions that require treatment before planning.

Comparing the patient's ridge to an ideal ridge helps assess the condition of supporting tissues, emphasizing the importance of maintaining the alveolar ridge for denture fabrication. Common surgical treatments in preprosthetic surgery include alveoloplasty, frenectomy, and vestibuloplasty. Post-tuberosity notching improves denture stability and resistance to dislodgment forces.

Achieving these objectives in conventional prosthesis construction facilitates wide distribution of functionally generated forces, reducing adverse soft tissue and bone alterations, and enabling satisfactory function.

4. Alveoloplasty

Alveoloplasty, recommended after nearly every tooth extraction, whether single or multiple, involves shaping the alveolar process. In 1853, Willard[1] reduced the alveolar border following dental extractions. Beers[2] described alveolectomy in 1876, a procedure using forceps to remove a significant portion of the alveolus. In 1923, Molt[8] performed an alveoloplasty while preserving the interdental septum. Dean[9] achieved alveoloplasty in 1936 by compressing the buccal cortical plate and removing the interseptal bone. Obwegeser[10] modified this procedure in 1966 to reduce premaxillary protrusion by simultaneously fracturing the labial and palatal cortices.

4.1. Maxillary tuberosity reduction

The maxillary tuberosity may be excessive either vertically or laterally. Excess vertical space prevents proper placement of the occlusal plane and teeth, while lateral excess complicates the path of insertion and restricts the thickness of the buccal flange of the denture between the tuberosity and the coronoid process. It is essential to examine the mounted diagnostic cast to determine the extent of the required reduction. A thorough radiographic evaluation is necessary to rule out sinus perforation. The reduction procedure begins with an elliptical incision and mucoperiosteum reflection to expose the tuberosity. Bone is then removed using rongeurs or burs, the area is smoothed with a bone file, and irrigated liberally with saline solution. The wound is typically closed afterward.

1. Incision extended along crest of alveolar ridge distally to superior extent of tuberosity area.
2. Elevated mucoperiosteal flap provides adequate exposure to all areas of bony excess.
3. Rongeur used to eliminate bony excess.

4.2. Tissue reapproximated with continuous suture technique

E-Cross-sectional view of posterior tuberosity area, showing vertical reduction of bone and re-apposition of mucoperiosteal flap. (In some cases removal of large amounts of bone produces excessive soft tissue, which can be excised before closure to prevent overlapping.

4.3. Prominent mylohyoid ridge reduction

The mylohyoid ridge becomes pronounced due to resorption in the height of the posterior mandible's ridges, which restricts the expansion of the denture in this area. This often leads to discomfort for denture wearers. Additionally, the tonicity of the mylohyoid ridge can cause issues with denture retention. According to Gillies,[11] (1956) the mylohyoid ridge should be reduced whenever it is found to be at the same level or higher than the alveolar process.

4.4. Exostoses and tori

Buccal exostoses are typically found on the buccal side of the higher ridge. These bony outgrowths prevent proper fitting of the flanges and border seal, complicate the positioning of the teeth, and hinder the proper shaping of the flange. Surgical reduction is required to address these issues.

The palatal torus is a benign, slowly expanding growth formed by the palatine processes of the maxillae and sometimes the horizontal plates of the palatine bones. The exact cause of the palatal torus is unknown, but possible etiological factors include heredity, superficial trauma, malocclusion, and a functional reaction to mastication. It is often composed of cortical bone, though some may contain cancellous bone. Surgical excision is necessary when the palatal torus completely fills the palatal vault and extends beyond the palate.

Mandibular tori are removed in three situations:

1. When they enlarge to the point of interfering with speech or eating.
2. When the surrounding mucosa ulcerates due to trauma and does not heal.
3. To facilitate the creation of removable partial and complete dentures.

4.5. Reduction of genial tubercles

As the jaw resorbs, the region where the genioglossus muscle connects to the anterior part of the mandible may become more prominent. In some cases, the tubercle can serve as a shelf for denture construction, but often, reduction is necessary to effectively create the prosthesis. Before deciding to eliminate this prominence, it is important to consider the possible augmentation of the front section of the mandible rather than reducing the genial tubercle. If augmentation is chosen, the tubercle should be left in place to support the graft in this area. Appropriate anaesthesia should be achieved using bilateral lingual nerve blocks and local anaesthetic infusion.

4.6. Soft tissue procedures

4.6.1. Hyper mobile ridge

Resorption of the remaining ridge beneath an ill-fitting denture with uneven occlusion can cause hypermobile ridge tissue, commonly seen in the anterior region of the mandibular ridge. This condition typically occurs in the anterior maxilla due to anterior hyper occlusion of a Class I removable partial denture or a maxillary complete denture against the mandibular natural teeth. Although it is usually necessary to remove the excessive ridge tissue, any possibility of bone augmentation should be considered before excision. The associated tissue should always be preserved.

Treatment of hypermobile tissue includes:

1. Occlusal correction of the entire denture using a new interocclusal record and remounting.
2. Period of tissue rest to reduce inflammation.
3. Maintaining appropriate oral and denture hygiene.
4. Using a mucostatic impression technique.

Surgical options for treating hypermobile tissue include subperiosteal dissection, electrosurgery, or simple clipping of the excess tissue without disturbing the associated tissue. Mucoperiosteal reflection should be minimized to reduce postoperative bone resorption.

Excess vertical and lateral soft tissue in the maxillary tuberosity can obstruct the proper alignment of the occlusal plane, affect the border seal in the post-molar pocket area, and hinder the path of insertion. In such cases, electrosurgery or sharp dissection may be used to remove the excess tissue. However, if the tissue is firm and does not affect the stability, insertion path, or flange thickness of the denture, removal is not recommended.

4.7. Frenectomy

A high attached frenum can lead to a loss of border seal, preventing the upper denture from staying in place. The deep labial notch created to accommodate such a prominent frenum can weaken the denture and increase the risk of midline fracture. The issue can be addressed using techniques such as Z-plasty, V-Y advancement, or diamond excision.

A prominent lingual frenum can cause lower denture instability. To test tongue function, the patient should be able to touch their upper lip with the tip of their tongue without moving the lower denture. If they cannot, a frenectomy is recommended. After a frenectomy, the lower denture is used as a stent to prevent postoperative recurrence.

A large buccal frenum, being flexible and flaccid, rarely hampers denture function.

4.8. Epulis fissuratum

Epulis fissuratum is the hyperplasia of the sulcular epithelium brought on by a denture that fits poorly or has settled as a result of resorption causing chronic discomfort. The sulcus between the two outer and inner folds, which make up the hyperplasia, may be ulcerated.

4.9. Papillary hyperplasia

Papillary hyperplasia can be caused by factors such as a low-grade Candida infection, an ill-fitting denture, or a palatal relief chamber in the denture. These conditions result in soft, polypoid masses with numerous papillary projections that are highly red. With proper oral hygiene, care of the

dentures, and attention to oral tissues, most lesions will resolve on their own. However, if the lesions persist, they need to be surgically removed. Treatment options include electrocautery, sharp excision, cryosurgery, laser excision, laser ablation, and curettage with large rotary burs.

4.10. Mental nerve repositioning

In patients with severe atrophy of the mandibular alveolar process, the mental foramen may be located at or near the crest of the residual ridge. This positioning can result in pressure on the mental nerve from the denture flange. Patients often experience pain similar to trigeminal neuralgia, including a dull, burning sensation or abrupt, sharp, severe pain that lasts briefly. Pain can be triggered by digital pressure on the mental foramen or during mastication, and some patients may also report lower lip pain and numbness.

For many patients, simply relieving the denture flange to alleviate pressure on the mental foramen is sufficient to resolve these symptoms. However, if this does not provide adequate relief, additional measures may be necessary. In such cases, surgical repositioning of the neurovascular bundles and enlargement of the mental foramina may be required to address the issue.

4.11. Ridge extension procedures

Vestibuloplasty is a surgical technique aimed at deepening the vestibule by lowering muscle attachments on the buccal, labial, and lingual aspects of the residual ridges to improve the alveolar ridge's contour. In 1935, Kazanjian[12] introduced a technique for deepening the vestibule by covering the newly exposed bone with a labial flap taken from the alveolar process, allowing the lip surface to re-epithelialize. A key drawback of this approach is the loss of vestibular depth due to scar contracture on the labial aspect.

To address this issue, Clark[5] (1953) proposed a vestibuloplasty technique where the flap is pedicled off the lip rather than the alveolar process. Tortorelli[13] (1968) recommended horizontally fenestrating the periosteum at the base of the newly created vestibule to prevent regression following Clark's method. Howe (1965)[14] and Kethley and Gamble (1978)[15] described the "lip switch procedure," a variation of Kazanjian's technique where an initial lip incision creates a labial mucosal flap extending to the crest of the ridge.

In 1959, Obwegeser[16] introduced a submucosal vestibuloplasty technique, which raises the anterior vestibular area when there is sufficient mandibular height, enhancing denture stability and retention. This procedure is indicated when there is adequate vestibular depth on the lingual aspect of the mandible, inadequate facial vestibular depth from mucosal and muscular attachments in the anterior mandible, and at least 15 mm of anterior mandibular height. These methods often yield satisfactory results without requiring hospital stays, donor-site surgeries, or prolonged denture-free periods. However, the degree of vestibular depth relapse is unpredictable, and issues may arise with adjusting the denture's peripheral flange to the vestibule's depth.

On the lingual aspect of the mandible, the mylohyoid and genioglossus muscles, along with labial muscle attachments, can cause similar issues. Trauner[17] addressed these problems by repositioning the mylohyoid muscles inferiorly and separating them from the mylohyoid ridge, thus deepening the floor of the mouth and reducing the mylohyoid muscle's impact on the denture. Clark's supraperiosteal flap technique, labially pedicled, can be used for extending the labial vestibule. After these vestibular extension procedures, the denuded periosteum area may be covered with a skin graft.

Combining vestibular extension with split-thickness skin grafting, especially when there is at least 15 mm of mandibular bone height and insufficient alveolar ridge for denture support, is recommended. This approach provides a broad base of fixed keratinized tissue and eliminates mucosa and muscle attachment forces that can dislodge the denture. Prior to soft tissue procedures, any significant bony irregularities should be corrected with grafting or small-scale alveoloplasty to ensure the remaining bone contour is suitable for denture construction. The early covering of the exposed periosteal bed enhances patient comfort and allows for earlier denture construction, producing predictable long-term results.

Muscle and mucosal attachments that affect denture construction, stability, and retention are often a result of maxillary alveolar bone resorption. While the maxilla's large denture-bearing area can often support adequate denture construction and stability after significant bone loss, additional soft tissue changes or modifications may be necessary alongside previous augmentation surgeries.

Several techniques can provide additional fixed mucosa and vestibular depth in the maxillary denture-bearing area. One effective method for correcting soft tissue attachments on or near the crest of the maxilla's alveolar ridge is the submucosal vestibuloplasty, as described by Obwegeser.[18] This technique is particularly useful when there is sufficient bony maxilla remaining for adequate denture support. It involves either excising or repositioning the underlying submucosal tissue, allowing the labiovestibular mucosa to adhere directly to the periosteum of the remaining maxilla. Adequate mucosal length is needed to achieve vestibular depth without causing an abnormal appearance of the upper lip.

When there is insufficient labiovestibular mucosa and submucosal vestibuloplasty would result in lip shortening, alternative vestibular extension techniques should be considered. For these cases, mucosa pedicled from the

upper lip can be sutured at the depth of the maxillary vestibule following a supraperiosteal dissection, as a variation of Clark's[5] vestibuloplasty technique. The alveolar ridge's denuded periosteum heals through secondary epithelialization. This approach typically requires a longer healing period of 6-8 weeks before denture construction, and moderate discomfort may be experienced during the postoperative phase.

4.12. Ridge augmentation

Augmentation of atrophic alveolar bone involves implanting graft materials, and the techniques used can significantly impact postsurgical morbidity. These methods range from basic subperiosteal tunneling to more extensive osteotomies. Techniques such as distraction osteogenesis, allografts, and bone grafts are employed to enhance the residual alveolar ridge. The choice of technique depends on patient compliance, the specific site, the amount of remaining alveolar bone, and the cause of bone resorption. For severe ridge deformities, autogenous bone grafts are often the preferred choice. Significant amounts of autogenous bone can be harvested from the iliac crest and calvarial bone in cases of severe atrophy. However, iliac onlay grafts, due to their different embryonic origins, tend to resorb more compared to calvarial grafts, with membranous bone maintaining its volume better than endochondral bone.

When severe mandibular resorption results in insufficient height and contour, leading to an increased risk of fracture, or when implant placement is planned in areas with inadequate bone width or height, superior border augmentation with a bone graft may be required. In 1948, Clementschitsch[19] reported using autogenous corticocancellous blocks from the iliac crest for superior border augmentation. Today, these bone blocks are often secured to the mandible with small, rigid fixation screws to minimize graft mobility. Bone augmentation is frequently combined with membrane-guided tissue regeneration, and implants may sometimes be placed simultaneously with bone graft augmentation.

The inferior border augmentation technique for atrophic mandibles was first clinically applied by Sanders and Cox.[20] Although rarely used today, this method involves augmenting mandibular bulk with iliac crest bone grafts secured with rigid fixation. This approach addresses both alveolar ridge atrophy and the prevention of atrophic mandibular fractures. However, it does not correct abnormalities in the denture-bearing regions caused by mandibular atrophy, such as the exposed position of the mental nerve, irregularities in the superior border, or increased interarch distance.

During a visor osteotomy, the mandible is split buccolingually, and the lingual cortical plate is moved superiorly. This horizontal osteotomy with interpositional graft aims to address the defect created by elevating the superior aspect of the ridge, allowing for grafting to achieve a predefined height. Grafts are typically sourced from the cancellous marrow and corticocancellous iliac crest. Corticocancellous blocks are shaped to a specific size and placed between the mandible and the pedicled bone for augmentation. Generally, two blocks are positioned in the cuspid regions, two in the molar regions, and one in the midline. Cancellous marrow and corticocancellous chips are packed into the space between the cortical struts and at the graft interface with the mandible.

A method for directly augmenting the maxilla with a contoured rib was described by Baker and Connole[21] in 1977. This technique involves an osteotomy to separate the superior and inferior dimensions of the residual jaw, followed by grafting bone into the osteotomy to create an interpositional bone graft. The initial documentation of interpositional augmentation for the atrophic maxilla was provided by Farrell et al.[22] in 1976, Bell et al.[23] in 1977, and Bell and Buckles[24] in 1978. Bell and McBride[25] described the Le Fort I osteotomy in 1977. When the palatal vault is well-formed but the ridge height is insufficient, interpositional bone grafting in the maxilla is indicated. This technique can also address transverse and anteroposterior discrepancies between the mandible and maxilla, producing stable and predictable outcomes while potentially eliminating the need for additional soft tissue procedures.

However, a drawback of this approach is the need to harvest bone from the iliac crest donor site, which may necessitate further soft tissue surgery. Additionally, inadequate bone support and the extension of the maxillary sinuses into the alveolar ridge can complicate implant placement in the posterior maxillary area. In such cases, a sinus lift procedure can be performed to augment the alveolar ridge by inserting graft material into the sinus. This involves carefully lifting the sinus lining from the bony floor by creating an incision in the lateral aspect of the maxillary wall. Graft materials for this procedure can include autogenous bone, allogeneic bone, or a combination of both.

For patients with a well-formed palatal vault but insufficient anterior and posterior bone, total maxillary osteotomy with interpositional bone grafting should be considered. This approach is also suitable for patients with maxillary transverse deficiency and bone loss presenting a relative Class III deformity. Various surgical techniques can be employed to achieve palatal vault osteotomy and elevation, including total maxillary osteotomy with palatal vault elevation. Both techniques rely on pseudo-augmentation of the alveolar ridge to enhance stability and depth of the palatal vault. If desired, interpositional bone grafting can be integrated with the total maxillary osteotomy with palatal vault elevation. The palatal vault osteotomy was first described by Charest and Goodyear.[26]

5. Maxillomandibular Ridge Relationships

An aberrant ridge relationship resulting from tooth loss complicates the creation of prosthetic appliances. To accurately assess the anteroposterior and transverse relationships between the maxilla and mandible in completely edentulous patients, it is crucial to position the patient's jaw in the correct occlusal vertical dimension. Diagnosing this during the preliminary stage may require constructing bite rims with appropriate lip support. Additionally, lateral cephalometric radiographs are essential to confirm the clinical findings.

In cases of partially edentulous patients where segmental alveolar surgery has reduced the interarch space or led to supraerupted teeth and bony segments encroaching into an edentulous area, constructing a suitable fixed or removable prosthetic appliance can be challenging. For segmental surgery, models can be cut, and teeth repositioned as needed. The final placement of segments on the articulated models should be determined by the dentist who will perform the patient's prosthetic restoration. After model surgery, a splint is created to ensure precise positioning of the segments during the procedure and to provide stability during the healing phase.

Corrective surgery on the ramus or ramus-body portion of the jaw for an edentulous protrusive mandible is rarely indicated. Maintaining the transverse dimension of the mandibular ridges and the maximum denture-bearing surface is essential. For significant mandibular asymmetry or corrections exceeding 12 mm, extraoral subcondylar osteotomy is recommended. This method facilitates the removal of the coronoid process, stripping of the internal pterygoid muscle, and modification of the proximal and distal bony segments for optimal approximation. Additionally, wiring the segments can help seat the condyle properly in the glenoid fossa.

When the setback required is 10 mm or less, intraoral subcondylar osteotomy is a viable option. The Sagittal osteotomy is particularly effective for correcting mandibular protrusion, provided the correction is symmetric and the total setback does not exceed 10 mm. For significant mandibular asymmetry, alternative approaches or body osteotomies should be considered. It is important to release the internal pterygoid muscle from the proximal segment to allow unrestricted retrusion of the distal segment and prevent movement of the proximal segment.

Although less frequently encountered than prognathism, the retrognathic mandible is an important consideration because correcting it can lead to an ideal jaw relationship, enhancing prosthetic reconstruction. The sagittal osteotomy is the most predictable procedure for this purpose, as it is effective for arching osteotomy or correcting prognathism. Variations such as the "L" and "C" osteotomies, which are adaptations of the arcing ramus osteotomy, involve modifications like sciatic splitting of the mandibular inferior border.

Maxillary malrelationships generally fall into four categories: (1) retrusion, (2) protrusion, (3) vertical deficiency, and (4) vertical excess. Anterior maxillary vertical excess often correlates with maxillary protrusion. A retrognathic maxilla may result from severe alveolar process resorption or represent a true skeletal deformity. Occasionally, this condition is associated with a deficiency in the transverse dimension. While mandibular setback procedures have traditionally managed edentulous Class III jaw relationships, maxillary osteotomies, which modify skeletal relationships, have proven to be stable and reliable. Thus, the Le Fort I osteotomy is considered the best correction for a retrusive maxilla, provided it is supported by appropriate analysis. Given the typically thin edentulous maxillary bone, corticocancellous grafts are recommended even for minimal advancements. These grafts are applied as onlays along the osteotomy sites and as blocks between the pterygoid plates and tuberosities. If there is a concurrent vertical deficiency, interpositional grafting can be used to achieve additional vertical height.

Protrusion, vertical excess, or a combination of both can pose challenges for prosthetic attempts, although this is relatively rare. The Le Fort I osteotomy is highly effective for correcting vertical excess and is versatile, allowing adjustments in the transverse, anteroposterior, or superior planes. Epker and Wolford[27] described a technique for superior repositioning of the maxilla that preserves the nasal floor; however, in edentulous patients, this approach may compromise the depth of the palatal vault. Typically, bone grafting at the osteotomy sites is not required with superior maxillary repositioning

5.1. Implants

Implant-supported prostheses have become a prominent alternative to conventional restorations for the dental rehabilitation of edentulous patients, offering significant improvements in masticatory function and overall well-being. For optimal implant success, several factors are ideal: a normal maxilla-mandibular relationship, healthy peri-implant soft tissues, and residual bone height and width of at least 10 mm and 6 mm, respectively. The use of autogenous bone grafts in conjunction with osseointegrated implants has been shown to significantly reduce bone resorption.

5.2. Lasers

Today's lasers are more advanced and versatile than ever, thanks to a range of technologies, materials (such as gases, solids, semiconductors, and colorants), and wavelengths. These advancements have made lasers a simple, safe, and effective tool in modern oral surgery. The ability of lasers to evaporate soft tissues without causing bleeding leads to wound healing without scarring or altering the healed

site. Additionally, lasers eliminate the need for sutures, a significant advantage in preprosthetic surgery as it prevents vestibule length loss associated with sutures. This capability makes lasers particularly suitable for preparing soft tissues in patients.

5.3. Alveolar distraction osteogenesis

Alveolar distraction osteogenesis is an alternative approach for reconstructing larger bone and soft tissue defects. The technique involves distracting bone along a vector transverse to its long axis, which promotes the formation of new bone. Initially applied to the human mandible, recent clinical reports have shown that severe alveolar ridge atrophy can be effectively treated using this method.

One of the key benefits of distraction osteogenesis is that it eliminates the need for additional surgery at the donor site. Additionally, the coordinated elongation of both bone and surrounding soft tissues is a significant advantage. To achieve favorable outcomes, it is crucial to extend and widen both hard and soft tissues. Alveolar distraction osteogenesis is particularly effective for elongating soft tissues in malfunctioning alveolar regions, enabling the restoration of soft tissues with appropriate quality and volume, especially in cases of moderate to severe defects.

5.4. Tissue engineering

Tissue engineering, the science of cultivating living human tissue for transplantation, is opening new possibilities for medical treatments and advancing preprosthetic surgery. Cell culture technology has revolutionized oral reconstructive surgery, initially applied to cultured skin and mucosal grafts. A major advantage of cell culture is its ability to expand a small biopsy specimen into large, transplantable mucosal tissues within weeks.

For example, gingival mucosa has been successfully replaced with cultured palatal mucosa. Studies have shown that after 4 months, these grafts developed well-differentiated, keratinizing mucosa similar to the palatal mucosa in situ. Although research into creating ex vivo intraoral skin/mucosal grafts has shown promising results, the complexity, duration, and cost of this process are significant when compared to simpler autogenous grafting methods. The most notable benefit of ex vivo produced grafts is the absence of donor-site morbidity.

6. Conclusion

The field of preprosthetic surgery in dentistry is advancing rapidly. Practitioners who treat patients undergoing complete denture prosthesis must be well-versed in the scope, capabilities, and limitations of common surgical procedures. To achieve the best possible outcomes, it is crucial for all specialists involved in the reconstructive process to work closely together and develop a well-defined treatment plan.

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None.

8. Conflict of Interest

None.

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