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Treatment Planning the Implant Patient

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Abstract: Establishing and arriving at a Diagnosis is the key to treatment planning and often practitioners tend to create a treatment plan overlooking the fundamental principles that must be taken into consideration prior to performing implant surgeries. The sequential process of clinical examination, laboratory tests, radiographic analysis, diagnostic protocols of casts, wax ups, along with the treatment needs and desires of the patient have to be factored in for the overall diagnosis and prognosis of implant therapy. A step-by-step methodology has been created to help the implant practitioner with a checklist that aims to create the optimal treatment plan for each case.

Keywords: Treatment planning, diagnosis, available bone, CT scans, wax-ups, surgical guides.

INTRODUCTION

With the inception of dental implants a completely new avenue has been opened in the treatment planning process. The use of partial or complete denture will not allow a patient to render normal function, aesthetic speech and comfort. Multiple studies have demonstrated a higher survival rate than other methods of teeth replacement other than partial dentures and fixed partial dentures. The goal of modern implant dentistry ensures the restoration must be surrounded by a soft and hard tissue environment in harmony with the existing dentition. Before formulating a treatment plan an implant practitioner should consider a broad and a complex set of interwoven factors. The sequential analytic planning, co-diagnosis of patient pre-treatment conditions and developmental of treatment plan that would fulfill, the patient's expectation for single tooth implant, multiple teeth implant or full arch reconstruction implant or tissue supported over denture. The objective of the treatment planning can be discussed by gathering the patient's history, taking diagnostic records, carrying out diagnosis and programming for surgical and prosthetic planning of the treatment (Fig. 1). The process allows for an organized documentation of the patient's pretreatment condition leading to treatment option in phases. The treatment phases can then be completed in a sequence that is consistent with what is clinically appropriate and compatible with the patient and clinician's schedule.

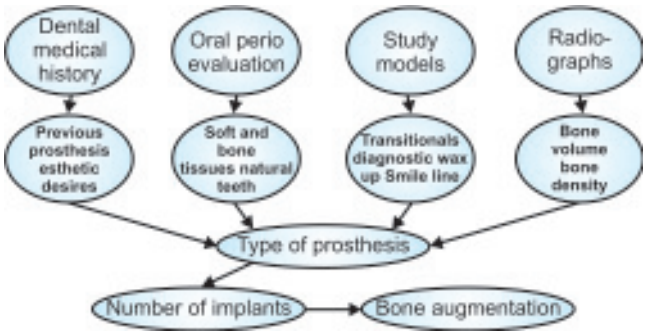

Fig. 1: Successful treatment planning

A good rapport between patient – doctor, a thorough comprehensive written evaluation and a multiphase treatment plan certainly leads to successful surgical and prosthetic complex restorative cases.[1] This process can take place over a period of 1-3 pretreatment appointment. This way the patient better understands the treatment options and risks vs benefits, thus appropriate informed consent is attained making the treatment acceptable and providing the treatment much more effectively and delivering it more efficiently.

INITIAL CONSULTATION

The initial consultation is the first assessment process thus allowing for the completion and reviewing of medical and dental history questioners and preliminary evaluation of patient, emotionally and psychologically. In gathering the patient's history in which the patient's profile is recorded in which age, sex, occupation and marital status is noted down. Then the chief complaint is recorded in the patient's words. While taking the medical history special attention should be given to whether the patient has the ability to physically and emotionally sustain all the procedures that may be required in the implant therapy including surgery, a variety of anesthetics, pain control drugs and prosthetic rehabilitation. History of uncontrolled medical conditions like diabetes, hypertension, and record of drug allergies, bisphosphonates and information on any drugs the

patient may be consuming should be noted down. Past dental condition with a history of periodontal disease, caries, trauma, change in occlusion or smile, any oral pathology or smoking habits should be noted down. If there is a history of change in occlusion then minor changes from missing tooth, major occlusion discrepancies or changes in TM joint should be examined and recorded. The consultation appointment allows an opportunity to get to know the patient and can also be utilized as a screening process of patients in whom the clinician establishes whether he can fulfill the patient's expectations and establish a long-term successful relationship.[2]

Dental History

- Chief complaint
- Pain/emergency
- Past dental treatment
- Past dental experiences
- Previous dental prosthesis (How long?)
- Patient concerns
- Cosmetic concerns
- Financial considerations

COMPREHENSIVE DIAGNOSTIC EXAMINATION

This appointment is much longer and is the most critically important aspect of restorative patient care. The patient's initial signs are documented like blood pressure, pulse and respiration and pertinent aspects of medical history is further investigated by screening radiographs, including panoramic and a full set of periapical X-Rays are taken. The patient is further examined in the following sequential order.

PHYSICAL EXAMINATION

Complete physical examination is possible only when the clinicians pick up emotional or physical abnormalities during pretreatment phase. Combining the information for health questionnaire and laboratory test results enable the doctor to categorize each patient into one of five classifications with patient's being normal to advanced state of disease. This being classified from class I to class V and formulated by American Society of Anesthesiology.[2] Due to long length of dental implant restorative treatment, the clinician should be sensitive to subtle changes in the patient's medical status during and after the course of treatment. The patient's chief complaint and desire and expectation should be documented. This will dictate the prosthetic needs and in turn the bone configuration and abutments that are required. Communicating from the prospective of what is important with respect to dental care or with reference to smile opens up the patient's thinking process and engages the patient as participant in the diagnoses as well as the treatment planning process. The treatment options and the range of prosthetic results that co-relate with the treatment results should be discussed with the patient as implant dentistry cannot match the needs and wants. It can only fulfill functional concern as primary and cosmetic concern as secondary.

EXTRAORAL EXAMINATION

Extraoral examination allows for evaluation of facial symmetry, skeleton profile, facial contours, and patient's speech skin nose lymph nodes, etc.

INTERAORAL EXAMINATION

Intraoral examination is visual as well as palpation process. Intraoral soft tissue is examined for any pathology. Evaluation of tongue and Para functional tongue habits should be examined along with lateral and frontal tongue thrust and factors of force. Muscle attachment on buccal or lingual aspect of natural teeth or implant site should be evaluated.

Dental Evaluation Factors of Force

- Normal biting forces
- Para functional forces
- Clenching
- Tongue thrust
- Position of arch
- Direction of load
- Crown implant ratio
- Bone density

PERIODONTAL EVALUATION

Periodontal evaluation includes periodontal charting, periodontal disease, classification and documentation of the location of quantity of keratinized attached gingiva. Bone loss, i.e. vertical or horizontal defect should be carefully mapped on the chart (Fig. 2) any gingival recession on maxillary or mandibular teeth should be examined. Oral prophylaxes of patient should be inspected for plaque or calculus. The patient should be radiographically and clinically evaluated with a comprehensive periodontal examination.

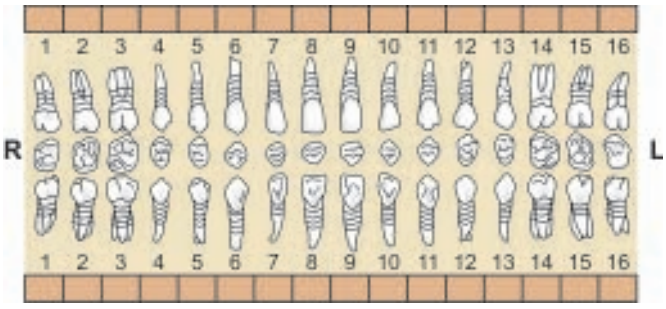

Fig. 2: Periodontal charting

BONY ANATOMY OF IMPLANT SITE AND ITS EVALUATION

The Skeletal profile has both esthetics as well as well-functional ramifications. The patient should be evaluated aesthetically while inspecting the edentulous arch. Skeletal profile classification relating the maxilla and the maxillary arch to the mandible and the mandibular arch is done with visual inspection mounted study models and by cephalometric radiographs. Mounted study models can assist in properly evaluating the arch form as well as inter arch relationship. The arch geometry impacts the position of dental implants, thus impacting the way the implants relate to each other in an anteroposterior direction. In a V shaped arch (Fig. 3)would land more easy to place implants with a great anteriorposterior ratio than a U-shaped (Fig. 4)arch or an arch with straight anterior ridge. In a tissue-supported over denture when using two implants, they are placed closed together in a V-shaped edentulous ridge as compared to U-shaped or square shaped ridge.[3,6] This limits the size of the retention clip as well as the connecting bar. Interocclusal opposing abutments relationship should also be considered, as greater the resorption the maxillary arch is more lingually placed to mandibular arch. The Interocclusal arch distance is the distance between the arches in a vertical direction (Fig. 5). It may become over closed due to supraeruption of the dentition into an edentulous space or posterior displacement of the condyle or wear of dentition as a result of loss of alveolar bone. This condition results in prosthetic challenge when there is a significant loss of alveolar bone, onlay grafts followed by soft tissue reconstruction may be considered to fulfill the patient's expectations. This would require several surgical procedures to achieve the expected results. While doing an onlay grafting procedure one should consider the systemic factors, endocrinologic status, social factors including smoking, post-operative restoration of bone as well as the fabrication of a provisional prosthesis for use during the healing stage that does not compress the graft. The implantologist should also take the phonetics in to consideration while planning edentulous arch.[4]

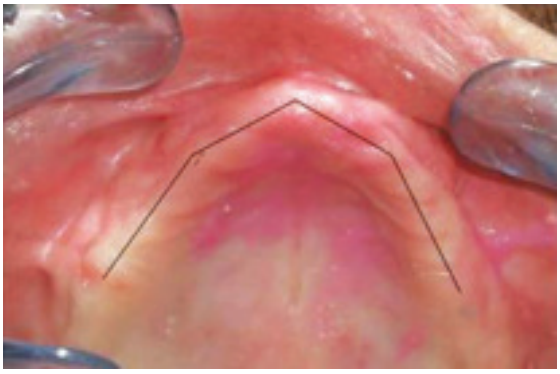

Fig. 3: V-shaped arch

Fig. 4: U-shaped arch

Fig. 5: Limited inter-arch space

Smile Analysis

All aspects of patient's smile should be analyzed and the patient's esthetics, expectations should be documented preoperated digital photographs can be utilized to evaluate and document the pretreatment smile.[7,8] The maxillary anterior teeth should show when the patient smiles. The anterior arrangement of teeth including teeth sizes as well as the positions in the arch should be documented. While analyzing the smile, the implantologist should look for any spaces, length of clinical crowns any recessions flaring teeth, attrition and shade of the teeth preoperative (Fig. 6) and check the feasibility of creating the golden proportions of a pleasing smile postoperative (Fig. 7).

OCCLUSION

The patient should be examined for the changes in occlusion due to the missing teeth. There may be premature contacts or major occlusal discrepancies due to trauma to occlusion. The patient's existing occlusion should be evaluated. In conjunction with the development of the treatment plan it is also necessary to create a diagnostic wax-up (Fig. 8) to determine spatial relationship (mesial, distal, buccal, and lingual) as well as the alignment and parallelism of the implants to be placed. In the edentulous space the tooth or teeth are fabricated using a base

plate. The diagnostic wax-up is duplicated into a stone model and a surgical template is fabricated to assist the surgeon in proper alignment, parallelism and direction of implants. The cuspid relationship as well as posterior tooth contact in centric as well as eccentric relationship should be documented. The patients over bite and over jet are measured along with the curve of Spee and curve of Wilson on the mandibular arch. Proper occlusion is patient dependant and should be based on bioengineering principles that will support that individual patient's stomatognathic system and abutment prosthesis apparatus.[5]

Fig. 6: Preoperative

Fig. 7: Postoperative

Fig. 8: Diagnostic wax-up

TEMPOROMANDIBULAR JOINT

The temporomandibular joint's movement should be thoroughly examined. Alteration in mandibular movement may be indicative of temporomandibular joint arthropathy and neuromuscular imbalance of the head and neck.

RADIOGRAPHIC AND IMAGING EXAMINATION

A full set of intraoral radiograph along with a panoramic method for evaluating routine patients. Panoramic radiographic images are the only studies that define the full scope of maxilla and mandible as well as accompanying vital structures, e.g. floor of the nose, floor of the sinus, roof of the mandibular canal, positioning of neurovascular bundle in one exposure. It produces a single image of the facial structures maxilla, mandible and supporting structures. It gives visualization of broad anatomic area with a low dose of radiation and convenient to use. In addition periapical radiographic images or digital images like RVG are indicated for residual dentition. When in doubt computed tomography is indicated to properly evaluate the patient's available bone. Which are three dimensional having reformatted images which can be reviewed with software program. The data by CT can be reformatted such that the clinician can accurately evaluate the tomography and density of the patient's bone. In some occlussal films, lateral cephalometrics may also be indicated for accurate assessment of patient's anatomy.

EDENTULOUS RIDGE

The edentulous area present in the patient's mouth is further evaluated. Classification of is described by Misch and Judy describing edentulous ridge as division—A bone is greater than 5 mm in width and over 10 mm in length. It is adequate in all dimensions and root form implants are usually the implant of choice. Division-B bone is between 2.5 mm and 5 mm in width. A division C ridge is and either lacking in height (C-H) or have inadequate width (C-W) to place a root form implant. The division-D ridge is severely atrophied and is the most challenging to restore prosthetically (Fig. 9).

Divisions of Bone

- Division A—5 mm wide 10 mm length
- Division B—2.5 mm wide 10 mm length (blade or graft)
- Division C-W unfavorable width
- Division C-H unfavorable height
- Division D (subperiosteal, illiac crest or sinus lift).

INFORMED CONSENT

The full informed consent process both oral and written should be conducted with the patient. Written consents should be secured for both the surgical and restorative procedures. There

- Divisions of Bone
- A
- B
- C-W
- C-H
- D

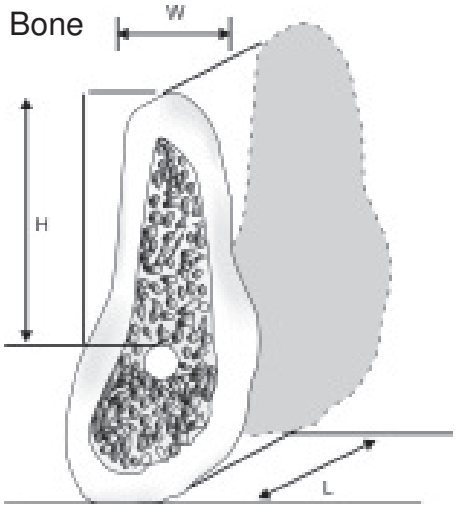

Fig. 9: Classification of bone volume

should not be any guarantees or surety rendered when dealing with artificial replacements in a biologic system. The possible risks and potential complications should be discussed. The patient should be informed about the various treatment options available for approval. He should be informed of the anticipated number of implants and whether an ancillary procedure such as sinus grafting is necessary. If maxillary antroplasty with augmentation bone grafting (a sinus lift) is indicated, the patient should be aware of the amount of bone remaining between the residual crest of the ridge and the sinus floor. The amount of residual bone determines whether the sinus graft can be carried out as a procedure before implant placement or a two staged procedure which could be performed simultaneously or at a gap of few weeks. The patient must be aware of the various materials available for the graft (in cases where grafting is required). There are six critical components of informed consent:

1. Diagnosis of the patient's condition requiring the proposed surgical or prosthetic treatment.
2. Nature and purpose of proposed treatment.
3. Material risks.
4. Likelihood of success.
5. Practical alternatives that have been proposed.
6. Prognosis of patient's treatment.

Thus several treatment options can be described at each phase of treatment allowing the patient the ability to choose acceptable alternative treatment plan which can later be modified to ideal treatment options. The nature of restorative dental treatment involving dental implants takes longer to complete than the conventional dental care. A multiphase treatment plan assists the patient in understanding the treatment options available. The patient should walk away from the final consultation with a clear understanding of the postsurgical obligations such as on going homecare. They should be given an overview of the armamentarium they will be using like brushes, floss, rinses, etc. An open attitude combined with comprehensive and systemic approach to diagnosis and treatment planning will lay foundation for successful results.

PERIODONTAL TREATMENT PHASE

The periodontal treatment phase is directed towards obtaining optimal health for the patient's periodontium as well as potential implant sites. The patients with type 2 or type 3 of periodontitis, root planning and scaling may be indicated. Osseous surgery may be indicated for deeper osseous defects. Mucogingival surgery can be done during the initial periodontal phase to obtain adequate attached keratinized gingiva. Esthetic periodontal surgery can be performed to enhance tissue contours. In an atrophied maxilla a soft tissue graft is considered following implant insertion.

NATURAL TEETH ABUTMENTS

The potential natural teeth as abutment and their prognosis should be evaluated as they relate to final prosthesis. Those teeth which are decayed, periodontally involved or malpositioned should be extracted and the bony ridge should be examined. Allograft material placed in the extraction site preserves the width of available bone; provide a better base for implant placement as well as to improve esthetics. The implant can be placed within 8-10 weeks if mineralized irradiated bank bone or autogenously bone is placed in the extraction site. When placing an implant into recent extraction sites in the maxilla, the use of osteotomes have an advantage when compared to bur as the bone is compressed rather than then removed.

PROVISIONAL PROSTHETIC PHASE

Provisional prosthetic phase can be accomplished with a removable prosthesis. It is utilized as a—

1. Diagnostic tool to establish esthetic arrangement of teeth.
2. A guide to occlusion and phonetics prior to final prosthesis.
3. A tool for maintaining esthetics refunctions during healing phase and time required to fabricate the final prosthesis.

The provisional crowns are utilized to develop tissue contours that confirm to natural looking crown.

MANIPULATION OF BONE AND DENTAL IMPLANT PHASE

Manipulation may lead to change from one division of bone to another desirable division of bone. It is the most challenging aspect to develop the implant site by manipulating through bone and soft tissues leading to implant integration so that it can be esthetically restored and support the stresses placed on it under function Misch and Judy has described 4 divisions of bone:

Division A

In division A bone: No manipulation is done and has root form of implants of adequate width greater than 5 mm and implant can be placed in ideal location.

Division B

- In division B: The bone can be expanded and one can do lateral or interpositional graft. A thin blade form of implant can be placed.

  Division B bone offers sufficient available bone height but the bone width ranges from 2.5 to 5 mm.
- An osteoplasty is done modifying division B ridge to division a ridge.

  Using thinner implants decrease the implant to bone surface area thus increasing the stress on the implant and bone under load so that one implant of thinner diameter may be placed to bear the load of one large diameter implant.

  When osteoplasty procedure is done in division B ridge the available bone will have decreased height thus increasing the crown to implant ratio of final prosthesis which would have longer looking crown. The three treatment options available for division-B edentulous ridge are:
  1. Modification of the existing division B ridge to another division by osteoplasty to permit the placement of root form implants 4 mm or greater in width.
  2. Insertion of a narrow division B root form implant.
  3. Modification of the existing division B bone into division A by augmentation.

Division C

The division C bone is deficient in one or more dimension (width, length, height, angulations or crown implant ration). Therefore the width may be less than 2.5 mm, the height less than 10 mm and the crown implant ratio greater than 1.

- A Division C-W ridge (Fig. 10) deficient in width requires a lateral onlay or a composite graft (Fig. 11), prior to placing an end osseous implant.

Fig. 10: Atrophic premaxilla

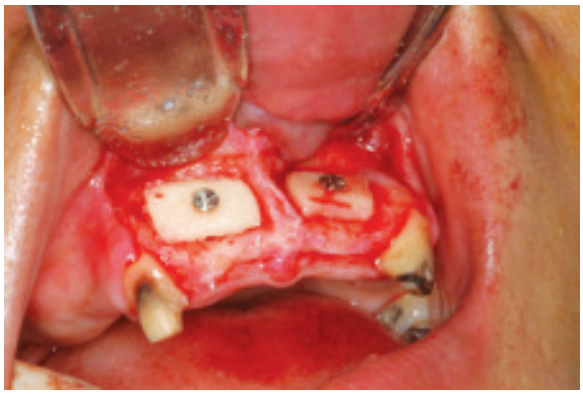

Fig. 11: Symphyseal block graft

- A Division C-H ridge deficient in height may be restored with an onlay graft followed by an endosseous implant or with a subperiosteal implant. The posterior maxilla or mandible is the most common locations of this condition as the maxillary sinus or mandibular canal limit the vertical height.

  Distraction osteogenesis allows for the increase in ridge length in which an endosseous implant is inserted.

  There are six treatment options for division C:
  1. Osteoplasty
  2. Rootform implants
  3. Subperiosteal implants
  4. Augmentation procedures
  5. Ramus frame implants
  6. Transosteal implants.

Division D

Division D ridge is the most challenging and requires clinical expertise. It has pencil thin ridge of mandible due to basal bone loss.

- A division D ridge can be treated with autogenous graft to upgrade the division followed by endosteal implants. In case of severely atrophied mandibular ridge a subperiosteal implant may be considered.

BONE GRAFTING AND BONE AUGMENTATION FOR IMPLANTS

The absence of tooth leads to bone loss and there is loss of keratinized gingival tissue. Thus replacement bone materials and soft tissue grafts are weapons against loss of alveolar bone and gingival tissue. Hard and soft tissue grafting enables the implantologist to recreate hard and soft tissue environment that natural teeth normally enjoy. The objective of tissue replacement is to recreate or regenerate the lost or damaged structure to equal as closely as possible as original in form and function including esthetics. The grafting material is biocompatible to the host receiving the graft at the hard and

soft tissue interfaces. Regeneration may be classified into guided bone generation GBR or guided tissue regeneration GTR. GBR refers to edentulous area whereas GTR refers to regeneration of bone, periodontal ligament, and cementum around teeth.

The guidelines for the ideal bone graft material were developed by BOYNE in 1973. The graft should be:

1. Readily available.
2. Foster rapid osteogenesis.
3. Not elicit an immunological response.
4. Enhance and support revascularization.
5. Be highly osteoconductive.
6. Not impede bone growth or tooth movement.
7. Provide support and continuity where mobility exists.
8. Provide for osteoconduction.
9. Provide for the formation of new attachments in the periodontal lesions.

because of risk of infection or epithelial connective tissue invasion into the grafted material, membranes are classified into absorbable and nonabsorbable. Absorbable material do not require removal while nonabsorbable material requires a second stage surgical procedure for removal of membrane. Ideal membrane should have following qualities:

1. Protect bone graft during bone formation.
2. Contain the bone grafted material to the grafted site.
3. Exclude the unwanted cells (e.g. epithelial fibroblasts).
4. It has noninflammatory effect on surrounding tissue.
5. Does not impede tissue generation.
6. Provide patient acceptability.

SURGICAL PHASE

The Branemark surgical protocol established osseointegration as an extremely predictable option for tooth replacement with excellent long-term stability. The surgical incision is designed to minimize the opening of the suture line. The incision should be done in one pass through mucosa and periosteum. Areas of soft tissue invagination in prior extraction sockets are excised so as to create a clean margin for the flap, devoid of epithelium.

The implantologist should decide the type of implant and its components to be used surgically and restoratively so that the benefits and limitations are defined. Whether the prosthesis is screw retained or cement retained can affect the axial inclination.

The two stage approach of placing the implant and burying under the soft tissue and after adequate period healing, the second stage surgery is performed with crestal incisions to expose the fixtures and connect a transepithelial abutment. After adequate soft tissue healing, the restorative dentist can fabricate the prosthesis.

In the esthetic zone, it is important to maintain adequate thickness on the buccal aspect of the implant for long-term stability of soft tissues and contours.[11]

Position and Angulations of Implant

Presurgical analysis can best determine the site. In a partially edentulous case or a single tooth implant being aware of the root morphology and inclination of the teeth adjacent to the implant site is crucial.

The initial drilling is done by a round bur after placing the surgical template at the surgical site. The ideal angulation is perpendicular to the plane of occlusion and corresponds to the cingulum of the teeth for a screw retained bar or prosthesis or incisal edge for cement retained fixed prosthesis. The template is then removed so, that the buccal and lingual contours of the bone may be observed during preparation. A small 1.5 mm diameter and cutting drill is used to continue with the bone preparation. The center of implant site is prepared first and the parallel pin is placed in the drill hole to check the angulations in labiolingual direction and also in the mesiodistal direction. The implant site must have adequate bone on the labial and lingual aspect. This requires a direct vision and a pumping motion to prepare the implant site depth which corresponds to the radiographically determined depth. Drills of intermediate diameter should be used for implant bone preparation. Gradual increase in drill diameter and reduces the amount of pressure and heat transmitted to the bone. The 1.5 mm of initial drill is followed by 2.0 mm, 2.5 mm and 3.0 mm respectively. The final drill diameter is used to prepare the implant receptor site under copious irrigation with the normal saline.

Implant Placement

The implant site is flushed with saline to remove any debris and is then suctioned. The implant is placed directly into the implant site by means of a preattached insertion mount. Once the first threads of the implant body engages the bone the same speed is used to tap the bone to insert the implant. The first stage cover (screw) is then inserted into the implant body. The tissues are approximated without tension and sutures are placed.

PROSTHETIC PHASE

The final prosthetic treatment phase should largely be the culmination of patient care inspired by patient's expectations. The healing step by step clinical protocol and the patients healing response and the number and location of abutments are the final determinant in the patient's prosthesis options. A denture can have additional retention by planning several implants, resulting in an implant supported tissue bone over dentures. This prosthesis can be further modified by adding additional implant abutment into implant supported, implant borne over dentures or a fixed prosthesis.

ESTHETIC ZONE

The anterior maxillary supported restoration is one of the most challenging restorations in the dentistry. The perceptions of

esthetics are based on matching the shade shape, surface texture, and luster of the restoration to that of adjacent natural teeth. The success and failure depends on the emergence profile – the transition zone from top of the implant shoulder through the soft tissue to the marginal area (Fig. 12). To ensure long-term implant survival it must use three criterions or else it will lead to esthetically compromised restoration. The three criterions are:

1. Ideal hard and soft tissue morphology.
2. Optimal type and position.
3. Adequate technical opinion relating to implant specific problem.

If all the above aspects are met it results in restoration that exhibit harmony, symmetry and overall continuity form.

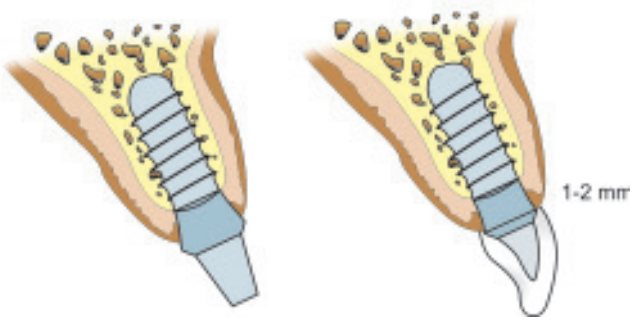

Fig. 12: Emergence profile

POSTSURGICAL IDEAL HARD AND SOFT TISSUE MORPHOLOGY

The success of a single tooth restoration is judged by comparing it with contralateral side which is a natural side surrounded by healthy tissues. Thus success is based on the quality of survival—the esthetic and functional outcome.

One of the first parameters to be assessed in a patient for implant therapy in the esthetic zone is the lip line. The higher the lip line the more visible the patient's teeth are.

The harmony and continuity of the hard and soft tissue depends on apicoronal location of gingival tissues

- Color
- Shape
- Texture
- Height of papillae

An important diagnostic factor in the predictability of the postplacement level of papillae is the assessment of crestal bone of teeth adjacent to the edentulous site.

If the distance between the crest of bone and the interproximal contact area is 5 mm or less. Ridge augmentation procedure for edentulous and partially edentulous patients can also be done to improve the soft tissue morphology.

Immediate Implant Placement can be a treatment of choice if the harmony and continuity of the supporting tissues are intact and the tooth is extracted thus the hard and the soft tissues are also preserved. The treatment time is also shortened.

Optimal implant type and position the optimal implant position is determined by and dependent of ideal tooth position.

In a single tooth implant or multiple teeth implants, the diagnostic wax of casts is a must as it can result un-natural profile crown contour and dissimilar papillae.

Successful implant placement must be accomplished in four planes:

1. Buccolingual
2. Mesiodistal
3. apicoronal
4. Antirotational device

The implant in the esthetic zone is placed primarily in relationship to ideal buccal emergence profile of the restoration. If the screw retained abutment is used the implant needs to be placed on palatal aspect as the abutment screw accessed needs to be in the cingulum area to avoid the incisal edge and facial aspect of the restoration. This palatal implant placement lead to ridge lap or more apical placement resulting in deeper peri-implant sulcus. Therefore the use of Angled Abutments to overcome problem with implant placed to screw hole access. The apicoronal location of the implant shoulder is dependent on bone morphology.

The size discrepancy between the tooth that is to be replaced and the diameter of implant that is to be used. Hence it is advantageous to select restoration—specific implant diameter that allow for the development of an adequate emergence profile while maintaining a shallow peri-implant sulcus. Long-term peri-implant sulcus considerations dictate that peri-implant sulcus should be as shallow as possible. In ideal circumstances, the implant shoulder should be placed between 3 mm and 4 mm apical to the emergence of the restoration from the gingival tissues correlating to the biologic height or width of the soft tissues around any implant.[9]

The Mesodistal dimension is dependent on available bone, root proximity of adjacent teeth (Fig. 13).

Access of the instrumentation. Labial height contour of the tooth to be restored.

To maintain the bone that supports the interproximal soft tissues between a tooth and an implant, there must be a distance of 2 mm and distance between two implants should be 3 mm.

The labiopalatal inclination of implant should be such that the implant is within a sound bony envelope with the long axis similar to that of adjacent teeth.[10]

The surgical template is an important tool to control implant placement effectively. Implant placement without surgical template leads to loss of control of exact implant positioning and would lead to esthetic failure.[11]

Buccolingual angulations of the implant in nonesthetic zone in not as crucial as mesiodistal spacing in achieving an adequate teeth form and interproximal spacing.

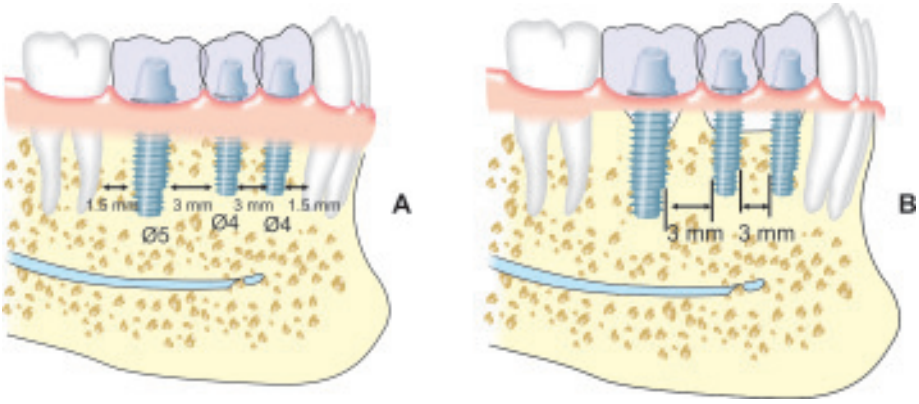

Fig. 13: Inter-implant distances

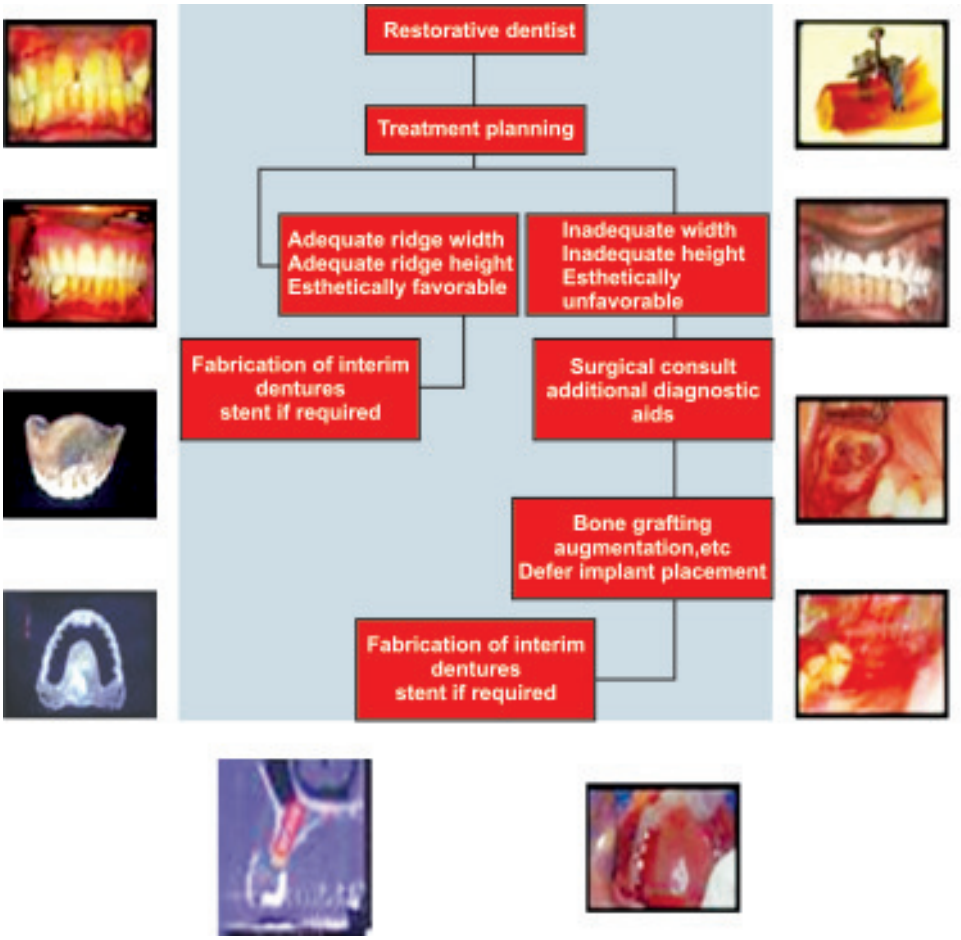

Fig. 14: Treatment planning

CONCLUSION

A review and various modalities of treatment planning have been presented and has been summarized (Fig. 14). Prior to treatment the medical and dental history is carefully evaluated. Treatment planning must begin with visualization of the end results. Visual examination with or without denture in place will give the implantologist and idea of lip and facial support required and some idea as to whether a fixed or removable restoration would be appropriate. A computer tomography scan provides the implant practitioner with availability and location of bone (thus it quantifies the volume, width and degree of mineralization of bone under soft tissues).

By paying attention to the minutest details and systematically analyzing each factor that effect the esthetic result recognizing the inadequacies in osseous and gingival contours the implantologist can take the advantage of the benefits of periodontal treatment (to enhance the esthetic and functional outcome).

Decision to alter the treatment planning should be made on an individual basis. The most common type of failures in implant dentistry is caused by poor treatment planning and poor surgical execution. It is important to manage the soft tissue from the earliest stages of implant treatment. Ideally the importance of soft tissue should be considered prior to extraction of tooth to be replaced. Improved support a most stable occlusion preservation of bone and simplification of prosthesis are a few reasons why an implant treatment is of choice.

Biomechanical failure range from loosening of screws to breakage of implant and its components (which is very common in multiple implants). Screw loosening is often reported problem in implant supported restorations especially with single tooth restorations.

Breakage of implant and implant components can occur due to poor treatment planning and exposing implants to excessive forces. In implant-restorations connection the screw acts much like a spring, the torque applied to the screw causes the threads to engage and continued torque after components are seated causes the screw to elongate. Thus proper components should be used to counter excessive destructive forces.

Even with all the disadvantages implants can be successfully executed when all the factors discussed are executed. Logical and ethical decisions need to be made with the patient and the implantologist has to evaluate the parameters outlined to ensure predictability of the restoration.

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