International Journal Dental and Medical Sciences Research
Volume 6, Issue 5, Sep - Oct 2024 pp 91-96 www.ijdmsrjournal.com ISSN: 2582-6018

Rehabilitation of mandibular edentulous arch with implant supported prosthesis: A treatment tree.

Dr. Khushbu Gupta[1], Dr.Deepesh Kumar Gupta[2], Dr.Neelima Chauhan[1]
[1]*Senior Resident Prosthodontics, Department of Dentistry, AIIMS Raipur*
[2]*Professor and Head, Department of Oral and Maxillofacial Prosthodontics and Implantology, Government Dental College, Raipur*
Corresponding Author: Dr. Khushbu Gupta

Submitted: 15-09-2024 Accepted: 25-09-2024

ABSTRACT: Rehabilitation of the edentulous mandibular arch poses a great challenge for the clinician. Advances in dental implant therapy have improved the treatment options for oral rehabilitation. The surface treatment of the implant improved its bioactivity, and use of both hard and soft tissue augmentation creates better opportunities for rehabilitating edentulous and partially edentulous jaws. This article explains the treatment options for rehabilitation of edentulous mandibular arch that will help the clinician to offer most appropriate and long lasting prosthesis to patients.

KEYWORDS: Rehabilitation of mandibular arch, implant supported prosthesis, fixed implant retained prosthesis, mandibular implant supported overdenture.

I. INTRODUCTION

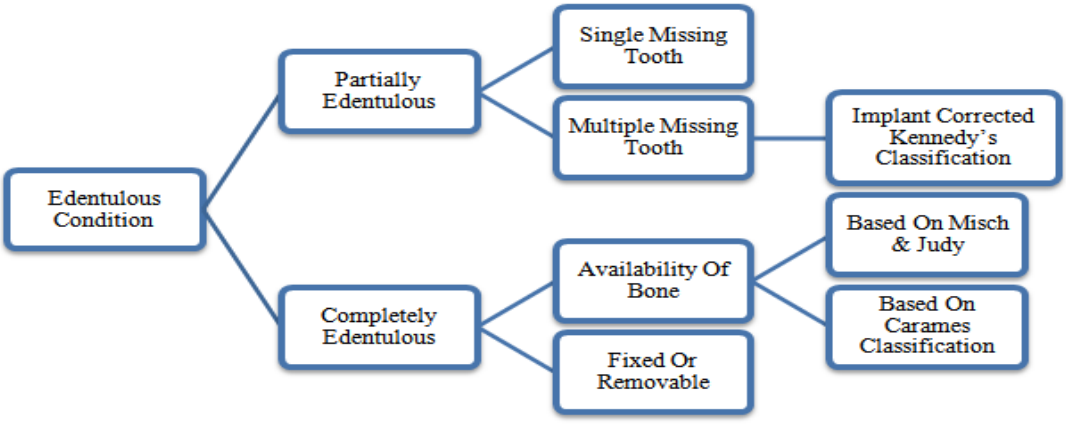
A fixed or removable implant-supported restoration offers a highly reliable treatment option for edentulous patients, helping them regain masticatory function, improve aesthetics, and enhance psychological well-being.[1,2]

Options for treating the edentulous mandible include: no treatment, traditional complete dentures, implant-supported fixed restorations, implant-retained and tissue-supported overdentures, implant-retained and implant-supported overdentures, and fixed prostheses.[3]

Various factors influence the complexity of tooth replacement. These include varying patterns of bone resorption and degrees of atrophy, the proximity to anatomical landmarks, and patient risk factors, all of which necessitate careful planning and the expertise of a skilled surgeon.[4]

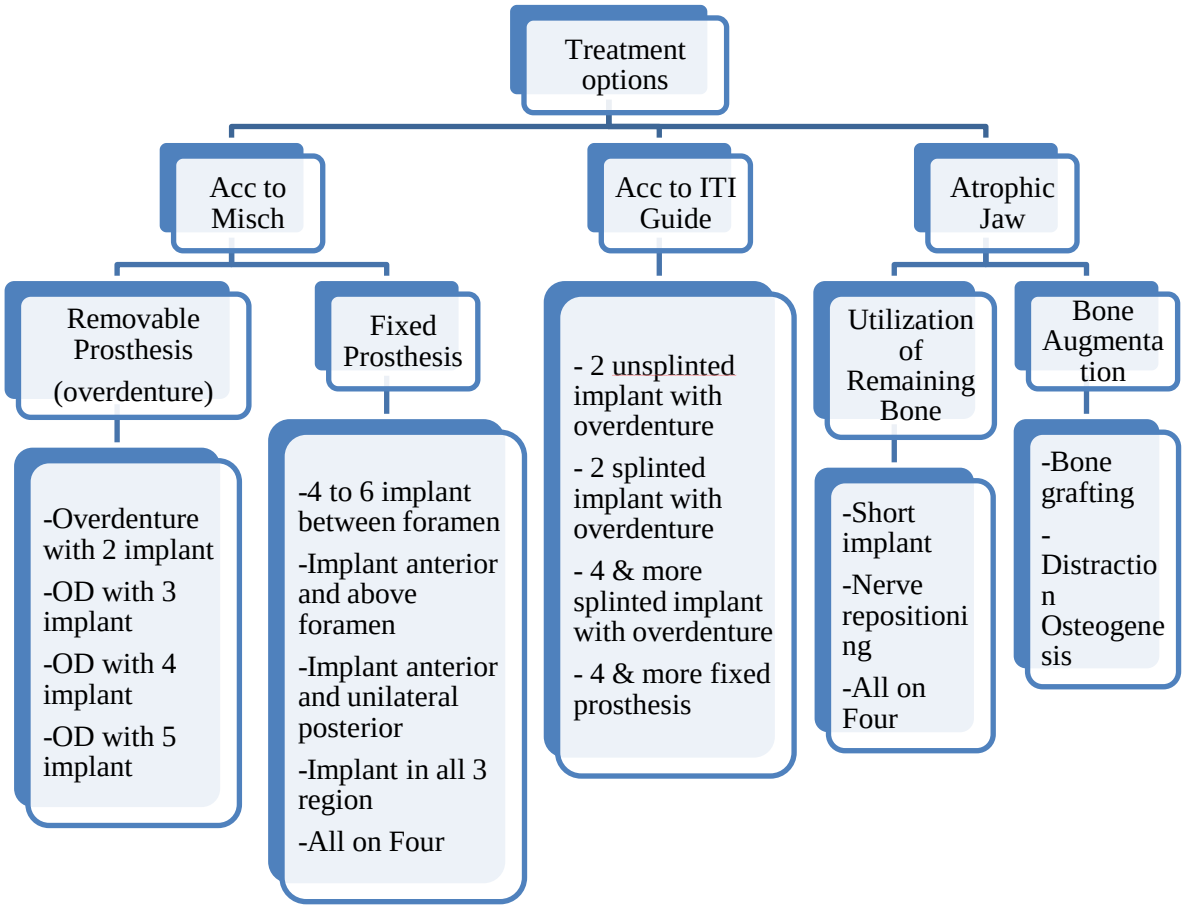
Several classification systems have been suggested to assist clinicians in diagnosing and planning treatment for full-arch implant rehabilitations, while also facilitating communication among patients, colleagues, and technicians.[5,6] Nonetheless, a classification system is still needed that simultaneously considers jaw anatomy and resorption patterns, the site of implant placement, surgical techniques, and the prosthodontics rehabilitation plan.[7,8]

II. TREATMENT OPTIONS FOR REHABILITATION OF MISSING TEETH IN MANDIBULAR ARCH:[9,10,11,12,13]



International Journal Dental and Medical Sciences Research
Volume 6, Issue 5, Sep - Oct 2024 pp 91-96 www.ijdmsrjournal.com ISSN: 2582-6018

III. TREATMENT TREE FOR REHABILITATION OF MISSING TEETH IN MANDIBULAR ARCH BASED ON DIFFERENT ANATOMICAL CONDITION AND RESEARCHER.[9,12,14]



IV. TREATMENT OPTIONS ACCORDING TO MISCH:

A. Mandibular Overdenture Treatment Options[9]

Option	Description	Removable Prosthesis Type
OD-1	2 implants (B and D positions) independent of each other	RP-5
OD-2	3 implants (A, C, and E positions)	RP-5
OD-3	4 implants (A, B, D, and E positions)	RP-4 (favourable force factors) RP-5 (unfavourable force factors)
OD-4	5 implants (A, B, C, D, and E positions)	Patient has high expectation for retention, stability and support.

Table 1.Mandibular Overdenture Treatment Options

International Journal Dental and Medical Sciences Research
Volume 6, Issue 5, Sep - Oct 2024 pp 91-96 www.ijdmsrjournal.com ISSN: 2582-6018

B. Mandibular Fixed Treatment Option[9]

Treatment option	Indication
Option 1: Four to Six Implants Between the Foramina	• Low force factors • Positive anteroposterior spread (ovoid or tapering)
Option 2: Implants Anterior and Over Foramina	• Must have adequate posterior bone • More implants required
Option 3: Implant in Anterior and Unilateral Posterior	• Higher force factors • Square arch forms
Option 4: Implants in All Three Regions	• Higher force factors • Poor anteroposterior spread • Poor bone density
Option 5: All-on-Four	• Immediate placement implants • Immediate loading

Table 2.Mandibular Fixed Treatment Options

V. TREATMENT OPTIONS ACCORDING TO ITI TREATMENT GUIDE:

Treatment option	Indication
Two unsplinted implant & overdenture[15]	• Mandibular height at least 10mm • Insufficient vertical dimension or tapered shape alveolar ridge
Two splinted implant & overdenture[11]	• Implant frequently placed at or mesial of position of canine teeth. • To reduce mandibular denture to rotate around fulcrum created between 2 abutment, place bar below incisal edge of lower teeth
Four or more splinted implant overdenture[11]	• Advisable when mandible height is less than 10mm & when opposing jaw has natural dentition. • When mandible has tapered arch shape
Fixed dental prosthesis in edentulous mandible[11]	• Fixed dental prosthesis make patient feel more natural like teeth • Not advisable in patient where lip support is required and poor hygiene cases • Implant number & position • If there is little intermaxillary space or patient has extreme Angle II / III jaw, there is risk that screw holes for FDP are in unfavourable position.
More than four splinted implant and Fixed Prosthesis[11]	• Mandible with limited vertical and sagittal resorption • Maxilla has been restored this far distally or in patient with 1st and 2nd maxillary molar present • Extreme Angle class II / III

Table 3.Treatment Options According To ITI Treatment Guide

VI. A COMPREHENSIVE CLASSIFICATION TO FULL ARCH IMPLANT REHABILITATION (CARAMES CLASSIFICATION)[13]

- The five classes (CCI-CCV) proposed for each edentulous jaw represent varying degrees of bone atrophy, as well as the typical therapeutic bone height and width observed in edentulous patients.
- For each Maxilla and Mandible CC Class, two fixed schemes (Options A and B) and one removable scheme (Option C) are suggested, considering factors like the number of implants, their distribution and position, as well as any necessary grafting procedures.

International Journal Dental and Medical Sciences Research
Volume 6, Issue 5, Sep - Oct 2024 pp 91-96 www.ijdmsrjournal.com ISSN: 2582-6018

Class	Available bone	Option A	Option B	Option C
Mandible CCI	Anterior– Bone height and width available greater than 16 mm and 6 mm respectively Posterior– Bone height and available greater than 12 mm and 6 mm respectively	Placement of six straight implants	Placement of four straight implants	Use of an overdenture supported by two or four non-splinted implants
Mandible CCII	Anterior – Bone height and width available greater than 16 mm and 6 mm respectively Posterior – Bone height and width available greater than 8 mm and 6 mm respectively	Placement of six straight implants. Short implant in first molar region	Placement of four implants in the anterior region with straight implant anteriorly and tilted implant posteriorly	Use of an overdenture supported by two or four non-splinted implants
Mandible CCIII	Anterior- Moderate resorption. Bone height and width available greater than 12 mm and 6 mm respectively Posterior– Advanced resorption. Bone height and width available greater than 4 mm and 6 mm respectively		Placement of four implants in the anterior region with straight implant anteriorly and tilted implant posteriorly	Use of an overdenture supported by two or four non-splinted implants
Mandible CCIV	Anterior- Advanced resorption. bone height and width available greater than 8 mm and 6 mm respectively Posterior – Severe resorption. bone height and width available lesser than 4 mm.	Placement of four implants in the anterior region with straight implant anteriorly and tilted implant posteriorly	Vertical bone grafting in the posterior region for the placement of two implants in the position of the first molar	Use of an overdenture supported by two or four non-splinted implants
Mandible CCV	Anterior- Severe resorption. Bone height and width available lesser than 8 mm and 6 mm respectively Posterior- Severe resorption. Bone height and width available lesser than 4 mm and 6 mm respectively	Placement of four short straight implants (4 or 6 mm) equidistant in the anterior region.	A more invasive surgery to augment the height and width of the mandible	Similar to the previously described removable options for Mandible Classes I, II, III and IV using two or four short implants.

Table 4.Carames Classification

VI. IMPLANT BASED REHABILITATION OPTIONS FOR THE ATROPHIC EDENTULOUS JAW

- Implant can be placed in atrophic mandible by 2 methods:

1) Augmentation Of The Remaining Bone[16,17]

A. Bone grafting
a) Ridge preservation
b) Ridge augmentation
i. Alveolar ridge split expansion
ii. Guided bone regeneration with particulate bone graft
iii. Onlay technique
iv. Inlay technique

B. Distraction osteogenesis[16,17,18,19]

2) Utilization Of Remaining Bone

A. Short Implant[20,21]
B. Nerve Repositioning[22,23]
C. All on Four[24,25,26]

VII. CONCLUSION

This article helps the clinician to choose the best treatment option for the rehabilitation of partially or completely edentulous mandibular arch based on the availability of bone, anatomical landmark, type of prosthesis and patients expectation.

REFERENCES

[1]. deBruyn H, Collaert B, Linden U, Bjorn AL. Patient's opinion and treatment outcome of fixed rehabilitation on Branemark implants. A 3-year follow-up study in private dental practices. Clin Oral Implants Res. 1997;8:265-71.

[2]. Dierens M, Collaert B, Deschepper E, Browaeys H, Klinge B, De Bruyn H. Patient-centered outcome of immediately loaded implants in the rehabilitation of fully edentulous jaws. Clin Oral Implants Res. 2009;20:1070-7.

[3]. Chee W, Jivraj S. Treatment planning of the edentulous mandible. British dental journal. 2006 Sep;201(6):337-47.

[4]. Cawood JI, Howell RA. A classification of the edentulous jaws. Int J Oral Maxillofac Surg. 1988;17:232-6.

[5]. Branemark PI, Hansson BO, Adell R, Breine U, Lindstrom J, Hallen O, et al. Osseointegrated implants in the treatment of the edentulous jaw. Experience from a 10-year period. Scand J PlastReconstrSurg Suppl. 1977;16:1-132

[6]. Jemt T. Fixed implant-supported prostheses in the edentulous maxilla. A five-year follow-up report. Clin Oral Implants Res. 1994;5:142-7.

[7]. Jensen OT. Complete arch site classification for all-on-4 immediate function. J Prosthet Dent. 2014;112:741-51 e2.

[8]. Papadimitriou DE, Salari S, Gannam C, Gallucci GO, Friedland B. Implant-prosthodontic classification of the edentulous jaw for treatment planning with fixed rehabilitations. Int J Prosthodont. 2014;27:320-7.

[9]. MISCH'S CONTEMPORARY IMPLANT DENTISTRY 4th edition by Randolph Resnik

[10]. Buser D, Belser U, Wismeijer D. ITI Treatment Guide, Vol 1: Implant Therapy in the Esthetic Zone for Single-Tooth Replacements. Berlin: Quintessence. 2007. 89. Nugent E. ITI treatment guide volume 6: extended edentulous spaces in the esthetic zone. British Dental Journal. 2013 Dec;215(12):633-. 90. Zarrinkelk HM, Jivraj S. Diagnosis and Treatment Planning: A Surgical Perspective. InGraftless Solutions for the Edentulous Patient 2018 (pp. 15-24). Springer, Cham. 91. Spencer KR. Implant based rehabilitation options for the atrophic edentulous jaw. Australian dental journal. 2018 Mar;63:S100-7.

[11]. Gallucci GO, Morton D, Weber HP. Loading protocols for dental implants in edentulous patients. International Journal of Oral & Maxillofacial Implants. 2009 Oct 2;24.

[12]. Spencer KR. Implant based rehabilitation options for the atrophic edentulous jaw. Australian dental journal. 2018 Mar;63:S100-7.

[13]. Caramês J. A comprehensive classification to full arch implant rehabilitation. Rev Port Estomatol Med Dent Cir Maxilofac. 2019;60:175-88.

[14]. Gallucci GO, Morton D, Weber HP. Loading protocols for dental implants in edentulous patients. International Journal of Oral & Maxillofacial Implants. 2009 Oct 2;24.

[15]. Becker CM, Kaiser DA. Implant-retained cantilever fixed prosthesis: Where and when. J Prosthet Dent 2000; 84: 432 – 435.

[16]. Louis PJ, Sittitavornwong S. Managing bone grafts for the mandible. Oral and Maxillofacial Surgery Clinics. 2019 May 1;31(2):317-30.

[17]. Tolstunov L, Hamrick JF, Broumand V, Shilo D, Rachmiel A. Bone augmentation techniques for horizontal and vertical alveolar ridge deficiency in oral

implantology. Oral and Maxillofacial Surgery Clinics. 2019 May 1;31(2):163-91.

[18]. Chiapasco M, Zaniboni M, Rimondini L. Autogenousonlay bone grafts vs. alveolar distraction osteogenesis for the correction of vertically deficient edentulous ridges: a 2–4-year prospective study on humans.

[19]. Elo JA, Herford AS, Boyne PJ. Implant success in distracted bone versus autogenous bone-grafted sites. Journal of Oral Implantology. 2009 Aug;35(4):181-4.

[20]. Thoma DS, Cha JK, Jung UW. Treatment concepts for the posterior maxilla and mandible: short implants versus long implants in augmented bone. Journal of Periodontal & Implant Science. 2017 Feb 1;47(1):2-12.

[21]. Yu X, Xu R, Zhang Z, Yang Y, Deng F. A meta-analysis indicating extra-short implants (≤ 6 mm) as an alternative to longer implants (≥ 8 mm) with bone augmentation. Scientific reports. 2021 Apr 14;11(1):1-27.

[22]. Abayev B, Juodzbalys G. Inferior Alveolar Nerve Lateralization and Transposition for Dental Implant Placement. Part I: a Systematic Review of Surgical Techniques. J Oral Maxillofac Res 2015;6(1):e2

[23]. Deryabin G, Grybauskas S. Dental implant placement with inferior alveolar nerve repositioning in severely resorbed mandibles: a retrospective multicenter study of implant success and survival rates, and lower lip sensory disturbances. International Journal of Implant Dentistry. 2021 Dec;7(1):1-4.

[24]. Chan MH, Holmes C. Contemporary "All-on-4" concept. Dental Clinics. 2015 Apr 1;59(2):421-70.

[25]. Chan MH, Nudell YA. All-on-4 concept update. Dental Clinics. 2021 Jan 1;65(1):211-27.

[26]. Durkan R, Oyar P, Deste G. Maxillary and mandibular all-on-four implant designs: A review. Niger J ClinPract 2019;22:1033-40.