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Combination Syndrome: A Review

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ABSTRACT

Specific oral destructive changes in the hard and soft tissues in patients with maxillary complete denture opposed by natural anterior teeth and a bilateral distal extension removable partial denture have been reported. The characteristic features that occur have been termed as combination syndrome by Kelly in 1972. Patient education and frequent recall and maintenance care are essential to prevent the development of this syndrome.

Keywords: Combination syndrome, Maxilla ridge resorption, Edentulism, Mandibular distal extension prosthesis

Abbreviations: CS: Combination syndrome; RPD: Removable partial denture; CD: Complete denture; GPT: Glossary of prosthodontic terms

INTRODUCTION

Completely edentulous maxilla and mandible with only anterior teeth remaining are common clinical situations that pose problems to both the dentist and the patient. Fabrication of maxillary complete denture and mandibular removable partial denture in such patients cause specific oral destructive changes. These changes are given the name combination syndrome. Combination Syndrome (CS) is defined as: "the characteristic features that occur when an edentulous maxilla is opposed by natural mandibular anterior teeth, including loss of bone from the anterior portion of the maxillary ridge, overgrowth of the tuberosities, papillary hyperplasia of the hard palatal mucosa, extrusion of mandibular anterior teeth and loss of alveolar bone and ridge height beneath the mandibular removable partial denture bases". It is also called anterior hyper function syndrome (GPT9).

REVIEW OF LITERATURE

Literature were collected from the previous published 40 articles using combination syndrome, maxillary anterior alveolar bone resorption, mandibular distal extension removable partial denture as key search words to evaluate the evidences and observations for this concept. Bone resorption in the anterior part of the edentulous maxilla and posterior part of the edentulous mandible has been the focus of many clinical studies and reports. Some conclusions may be drawn by comparing results from available studies.

Prevalence

Shen and Gongloff [1] examined the prevalence of symptoms associated with combination syndrome in 150 consecutive denture patients with complete maxillary dentures but different mandibular status, changes associated with combination syndrome were found to be prevalent in less than 7% of the total sample, but were found in 24% of patients with a bilateral distal-extension RPD.

Salvador [2] studied the prevalence index on signs of combination syndrome in patients rehabilitated with a maxillary complete denture opposing mandibular removable partial denture (Kennedy class I and class II). The overall prevalence index for combination syndrome was 25%. CS was not observed in patients with complete prosthesis and Kennedy class II RPDs.

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Kilicarslan [3] evaluated the prevalence and distribution of symptoms associated with combination syndrome among maxillary edentulous patients with different mandibular occlusal schemes - Natural dentition, Kennedy class II, Kennedy class I, Edentulous. When the symptoms of combination syndrome were examined, 50% of patients were found to have maxillary anterior alveolar bone loss. All five symptoms were identified in 9% of the patients studied, the majority (88.89%) were class I partially edentulous and the remainder (11.11%) were class II partially edentulous.

Resende et al. [4] have shown that a high prevalence of clinical signs was observed in patients wearing maxillary CD associated or not with mandibular Kennedy Class I RPD, but no association between RPD wearing and syndrome characteristics was found. A statistically significant difference was found between RPD wearers and non-wearers with regard to extrusion of mandibular anterior teeth only.

Clinical changes

Ellsworth Kelly [5] was the first person to use the term 'Combination Syndrome'.

He described five signs or symptoms that commonly occurred in this situation.

1. Loss of bone from the anterior part of the maxillary ridge.
2. Overgrowth of the tuberosities.
3. Papillary hyperplasia in the hard palate.
4. Extrusion of the lower anterior teeth.
5. The loss of bone under the partial denture bases.

Saunders et al described 6 additional changes or signs associated with this syndrome [6]. They include,

1. Loss of vertical dimension of occlusion
2. Occlusal plane discrepancy.
3. Anterior spatial repositioning of mandible
4. Poor adaptation of prosthesis.
5. Epulis fissuratum.
6. Periodontal changes.

Pathogenesis

Kelly stated that early loss of bone from the anterior part of the maxillary jaw is the key to the other changes of the combination syndrome. With the anterior loss of bone, a flabby hyperplastic connective tissue makes up the anterior part of the ridge. This hyperplastic tissue does not support the denture base and usually it folds forward, forming a characteristic deep fold or crease. As bone and ridge height are lost anteriorly, the denture tilts antero-posteriorly. This tilt results in negative pressure in the posterior region leading to the larger posterior residual ridge with the development of enlarged tuberosities. These enlarged tuberosities are usually made up of fibrous tissue, and in some patients the bone height seems to have increased also. With these changes, the occlusal plane migrates up in the anterior region and down in the posterior region. The cycle continues as one lead to another. After a time, the natural lower anterior teeth migrate upward, the anterior teeth on the complete denture disappear under the patient's lip, and both dentures migrate downward in the posterior region. The aesthetics are poor with the patient showing none of the upper anterior teeth and too much of the lower anterior teeth, and the occlusal plane drops down to expose the upper posterior teeth. Excessive bony resorption under the lower removable partial denture bases occurs to permit these changes, and often inflammatory papillary hyperplasia develops in the palate.

Kelly in 1972 originally described Combination Syndrome in a sample of six patients with maxillary complete immediate dentures opposing natural mandibular teeth and a distal extension RPD. Serial cephalometric radiographs were taken after initial healing of anterior part of maxillary ridge had taken place at 6-8 months and 1 year. All patients showed a loss of 1 to 3 mm of ridge height in the anterior region with loss of the underlying bone as well. All of them showed an increase of 1 to 2.5 mm height of the tuberosity with all and one having a corresponding increase in the height of the underlying bone. All the patients showed a 1.0 to 1.5 mm extrusion of the lower anterior teeth.

This oral condition is viewed as a rarely occurring syndrome with most signs and symptoms appearing in approximately 24% of the population wearing a maxillary complete denture opposing bilateral-distal extension partial denture. Carlsson [7] in 1998 reviewed about the sequelae of treatment with complete dentures and said that there was a lack of evidence for the combination syndrome as opposed to Kelly. Tolstunov [8] in 2007 proposed a clinically relevant classification of combination syndrome.

Classification

Three classes and 10 modifications of Combination Syndrome were described.

"Maxillary edentulous condition" defines the class, "Mandibular" defines the modification within the class.

Class I: Maxilla: Completely edentulous alveolar ridge.

Mandible:

Modification 1 (Ml): partially edentulous ridge with preserved anterior teeth only

Modification 2 (M2): stable "fixed" full dentition (natural teeth or implant-supported crowns/bridges).

Modification 3 (M3): partially edentulous ridge with preserved teeth in anterior and one posterior region.

Class II: Maxilla: partially edentulous alveolar ridge with teeth present in both posterior regions, and atrophic anterior region.

Mandible: modifications are the same as in Class I (Ml, M2, and M3).

Modification 1 (Ml): partially edentulous ridge with preserved anterior teeth only

Modification 2 (M2): stable "fixed" full dentition (natural teeth or implant-supported crowns/bridges).

Modification 3 (M3): partially edentulous ridge with preserved teeth in anterior and one posterior region.

Class III: Maxilla: Partially edentulous alveolar ridge with teeth present in one posterior region only, edentulous and atrophic anterior and one posterior region.

Mandible: Modifications are consistent with Class I and Class II (Ml, M2, M3A, M3B)

Modification 1 (Ml): Partially edentulous ridge with preserved anterior teeth only

Modification 2 (M2): Stable "fixed" full dentition (natural teeth or implant-supported crowns/bridges).

Modification 3 (M3A): Partially edentulous ridge with preserved teeth in anterior and one occluding posterior region.

Modification 3 (M3B): Partially edentulous ridge with preserved teeth in anterior and one non occluding posterior region.

This classification is based on the dominant features - an edentulous premaxilla with an advanced resorption of anterior maxillary bone and overgrowth of the anterior mandibular bone with extrusion of lower front teeth.

Maxillary ridge resorption

Bone resorption is inevitable and has been called “a major oral disease entity” [9]. Studies showed significant differences in residual alveolar bone between edentulous subjects wearing or not wearing removable dentures [10].

In a study [11] comparing bone resorption of the anterior maxilla in patients with complete maxillary dentures and varying mandibular status, no statistically significant differences were found between groups. Similarly, two other clinical studies [12,13] reported no significant differences in maxillary bone resorption between patients wearing a complete mandibular denture and those with natural teeth and an RPD or overdenture supported by the roots of the mandibular canines. Shen and Gongloff [1] showed that the presence or absence of a prosthetic replacement did not significantly affect the incidence of pathologic changes. Study by Kilicarslan [3] showed no statistically significant changes in maxillary anterior alveolar bone loss related to either mandibular occlusal scheme or presence of dentures.

In contrast to the above findings, Carlson et al. and Uctasli et al. [11,14] conducted a study on patients with a maxillary complete denture and different treatment modalities for partially edentulous mandible. The first group had no posterior teeth and no RPD; the second group had a class I mandibular RPD; the third group had an RPD retained by a bar splint uniting crowns, primarily on the canines. Over a 5-year period there was a significant reduction of the measured height of the anterior maxillary bone in the first 2 groups with similar mean values for both groups. In the bar splint group, no significant reduction in bone height was noted in the anterior maxilla. A reduction in the horizontal dimension in the anterior bone area of the maxillary residual ridge was noted in all groups without significant differences between them.

Maxillary bone resorption was also seen in patients with conventional maxillary complete denture opposed by implant supported fixed or removable prosthesis.

Haraldson and Naert [15] evaluated oral function on patients rehabilitated with implant-supported dentures and found that patients complained of reduced retention of the opposing conventional complete denture, indicating some degree of occlusal discrepancy and/or bone loss in the maxilla. Barber et al. [16] found that Combination Syndrome occurred in patients with trans mandibular implant supported over dentures and maxillary conventional dentures. With the use of cephalometric analysis, they found significant vertical bone loss and minimal horizontal bone loss after 2 to 4 years. The authors noted that this prosthesis “creates a similar biomechanical situation to the distal extension removable partial denture”.

A difference of opinion is seen in two studies investigating anterior maxillary bone loss under complete dentures opposing implant-supported fixed partial dentures. Jacobs et al. [17] reported an increased annual maxillary bone loss in 12 subjects whereas Henry et al. [18] did not observe any increase in the bone loss and development of the flabby ridges in the anterior maxilla in a 10-year follow-up study of 12 subjects.

Lechner in 1996 evaluated records of 13 patients who had worn a maxillary conventional denture and mandibular osseointegrated implant-supported overdenture for at least 3 years for subjective assessment of fit of the maxillary denture, occlusal integrity, and the status of the anterior maxillary ridge [19]. The findings of this study support the view that this combination of prostheses can result in perceived loosening of the maxillary denture, loss of posterior occlusion, increased anterior occlusal pressure, and anterior maxillary bone loss, similar to the effects seen in Combination Syndrome. Thiel et al presented a clinical report of combination syndrome associated with a mandibular endosseous implant-retained overdenture opposing a maxillary complete denture unsupported by implants or abutments [20]. The author stated that the increased force generation permitted by the Osseo integrated implants coupled with anterior functional contact encourages resorption of the anterior maxillary ridge. Studies found that

full mandibular implant-retained or supported prostheses based on four to six anteriorly placed implants against a complete maxillary denture provoke an extensive resorption of pre maxillary bone that is comparable with resorption affected from natural mandibular anterior teeth. Kreisler et al found continuous residual ridge resorption in the edentulous maxilla in patients with implant-supported mandibular over dentures during the 8-year follow-up period. Resorption was more pronounced in the anterior than in the posterior maxilla [21].

The above studies show extensive resorption of maxillary anterior ridge when maxillary complete denture is opposed by implant retained or supported fixed or removable prostheses.

Mandibular posterior bone resorption

It was suggested that the chance of developing conditions of the combination syndrome increases in persons wearing mandibular implant retained over dentures. The anterior maxillary ridge resorption was suggested to be a result of the posterior mandibular ridge resorption, both conditions being symptoms of the combination syndrome.

Maxson et al studied patients with trans mandibular implant-supported over dentures and observed findings consistent with Combination Syndrome [22]. Jacobs et al. [23] compared Osseo integrated implant-supported over dentures to conventional complete dentures and found greater posterior bone resorption under the over dentures. Neither of these two studies measured anterior bone loss.
Gupta et al. [24], inferred, rehabilitation of the edentulous mandible with an implant-supported fixed prosthesis opposing a maxillary complete denture did not show findings similar to Combination Syndrome. Further, loss of posterior occlusion was seen and could not be related to anterior maxillary bone loss. Tymstra et al. [25] also found no correlation between the posterior mandibular residual ridge resorption and the anterior maxillary residual ridge resorption. He concluded that patients rehabilitated with implant-retained mandibular over dentures are not subjected to more residual ridge resorption in the anterior maxilla when compared to patients wearing a conventional full denture. Regarding the mandibular posterior residual ridge, resorption was irrespective of wearing an implant-retained mandibular overdenture or a conventional mandibular denture Palmqvist et al [26] observed that in patients who received supported fixed dentures, bone resorption in the posterior part of the mandible practically ceased. Mandibular resorption was the most frequent complication (93.5%) in treatment-seeking wearers of maxillary complete denture associated with or without mandibular distal extension RPD.

Literature showed fewer studies regarding other signs of combination syndrome like overgrowth of tuberosities, extrusion of mandibular anterior teeth and papillary hyperplasia.

Sulun revealed that patients with edentulous maxilla and natural mandibular anterior teeth are approximately twice more likely to show risk of hypermobile tissue in the anterior part of the maxilla than completely edentulous patients [27]. Further, edentulous periods exceeding 30 years in maxilla seem to increase this risk approximately four times. Hence such patients should be rehabilitated with a definitive prosthesis to prevent the occurrence of combination syndrome.

Prevention

According to Kelly, prevention can be achieved by means of
1. Retaining weak posterior teeth as abutments by means of endodontic and periodontics techniques.

2. Endosseous endodontic implants and the amputation of one lower molar root to preserve the other as an abutment are some of the methods that could be applied.

3. An overlay denture on the lower may avoid the combination syndrome from developing.

Use of immediate denture showed lower rates of maxillary bone loss compared to delayed use of dentures after a healing period [28]. Lechner stated that where an implant-supported mandibular overdenture is planned, some form of stabilization of the maxillary arch is also considered to prevent the symptoms of combination syndrome.

Treatment objective

Saunders et al stated some specific treatment objectives [6].
1. The mandibular removable partial denture should provide positive occlusal support from remaining natural teeth and have maximum coverage of the basal seat beneath the distal-extension bases.
2. The design should be rigid and provide maximum stability while minimizing excessive stress on remaining teeth.
3. The occlusal scheme should be at the proper vertical and centric relation position.
4. Anterior teeth should be used for cosmetic and phonetic purposes only.
5. Posterior teeth should be in balanced occlusion.

Treatment Approach

Stefen **M. Schmitt** [29] described a treatment approach that attempts to minimize the destructive changes noted by using the treatment objectives of Saunders et al. The prosthesis is made in two stages using a modification of the complete denture construction technique. The mandibular removable partial denture is completed first. The tooth position, cusp height, sulcus depth, and marginal ridge position of the mandibular teeth will be determined using a cusp-sulci analysis. Later, the maxillary denture is completed and delivered to the patient. Acrylic resin teeth are used to replace the maxillary anterior teeth. Cast gold occlusal surfaces are made for the posterior denture teeth.

Tolstunov [8] stated prevention of posterior occlusion loss and anterior hyper function are considered the main treatment approaches for CS. The RPD is one of the treatment modalities to correct and treat CS by planning to preserve stability, including maxillary complete denture as antagonist, with a balanced distribution of occlusal forces and careful maintenance in order to preserve posterior occlusion.

Jameson [30] proposed an alternative approach to treat a patient requiring a new prosthesis and exhibiting conditions consistent with combination syndrome by using linear occlusion concept. Linear Occlusion is defined as "the occlusal arrangement of artificial teeth, as viewed in the horizontal plane, wherein the masticatory surfaces of the mandibular posterior artificial teeth have a straight, long, narrow occlusal form resembling that of a line, usually articulating with opposing monoplane teeth" [30,31].

Penarrocha et al. [32] proposed placement of implants in anatomic buttresses allow rehabilitation of atrophic maxillae in patients with combination syndrome. The implant success rate was high, and a mean marginal bone loss of 0.63 mm was recorded. Piermatti [33] reported rehabilitation of the edentulous maxilla with an implant overdenture in patients with combination syndrome.

In patients with combination syndrome, prior to insertion of implants, surgical correction of maxilla with alveoloplasty should be done. This restores the correct relationship between skeletal bases and allows the insertion of implants in a prosthetically oriented way [34].

Treatment modalities used to minimize the detrimental effects of combination syndrome in patients with mandibular implant supported overdenture opposed by conventional maxillary complete denture are:

1. Treatment plan for the retention of maxillary overdenture abutments. The use of overdenture abutments stabilizes the maxillary denture and resists the strong anterior forces that can cause ridge resorption in the premaxilla [35].
2. Placement of Osseo integrated implants with attachments in the anterior maxillary ridge will also improve the stability and long-term prognosis of the prosthesis. (Hansen 1990 and Jacobs 1993)
3. The use of maxillary ridge augmentation with hydroxyapatite in combination with anterior vestibuloplasty to provide a hard- and soft-tissue base suitable for a stable and retentive maxillary denture to oppose mandibular implants [36]. Onlay augmentations of the premaxilla have also been accomplished with autogenous and allogeneic bone.

CONCLUSION

Prevention of degenerative changes caused by complete dentures occluding with bilateral distal-extension removable partial dentures is possible through an appropriate treatment Plan. Periodic recall appointments need to be done to review the maintenance of occlusal harmony and the health of the supporting tissues. Both implant retained and implant supported prostheses have shown to be successful in prosthetic rehabilitation of partially and completely edentulous maxilla and mandible by slowing bone resorption. However, treatment plan should be modified to suit the needs of an individual patient.

REFERENCES

1. Shen K, Gongloff RK (1989) Prevalence of the 'combination syndrome' among denture patients. J Prosthet Dent 62: 642-644.
2. Salvador MC, Valle AL, Ribeiro MC, Pereira JR (2007) Assessment of the prevalence index on signs of combination syndrome in patients treated at Bauru School of Dentistry, University of Sao Paulo. J Appl Oral Sci 15: 9-13.
3. Kilicarslan MA, Akaltan F, Kasko Y, Kocabas Z (2014) Clinical evaluation of maxillary edentulous patients to determine the prevalence and oral risk factors of combination syndrome. J Dent Sci 9: 394-399.
4. Resende CM, Ribeiro JA, Dias KD, Carreiro AD, Rego MP, et al. (2014) Signs of combination syndrome and removable partial denture wearing. Revista de Odontologia da UNESP 43: 390-395.
5. Kelly E (1972) Changes caused by a mandibular removable partial denture opposing a maxillary complete denture. J Prosthet Dent 27: 140-150.
6. Saunders TR, Gillis RE, Desjardins RP (1979) The maxillary complete denture opposing the mandibular bilateral distal-extension partial denture: Treatment considerations. J Prosthet Dent 41: 124-128.
7. Carlsson GE (1998) Clinical morbidity and sequelae of treatment with complete dentures. J Prosthet Dent 79: 17-23.
8. Tolstunov L (2007) Combination syndrome: Classification and case report. J Oral Implantol 33: 139-151.
9. Atwood DA (1971) Reduction of residual ridges: A major oral disease entity. J Prosthet Dent 26: 266-279.
10. Josefowicz W (1970) The influence of wearing dentures on residual ridges: A comparative study. J Prosthet Dent 24: 137-144.
11. Carlson G, Bergman B (1967) Changes in contour of the maxillary alveolar process under immediate dentures. Acta Odont Scand 25: 1-31.

12. Tallgren A (1967) The effect of denture wearing on facial morphology: A 7-year longitudinal study. Acta Odont Scand 25: 563-592.

13. Crum RJ, Rooney Jr GE (1978) Alveolar bone loss in overdentures: A 5-year study. J Prosthet Dent 40: 610-613.

14. ÜÇTAŞLI S, Hasanreisoğlu U, Işeri H (1997) Cephalometric evaluation of maxillary complete, mandibular fixed-removable partial prosthesis: A 5-year longitudinal study. J Oral Rehabil 24: 164-169.

15. Haraldson T, Stalbad PA, Jemt T (1988) Oral function in subjects with mandibular overdentures supported by osseointegrated implants. J Oral Rehabil 15: 181-214.

16. Barber HD, Scott RF, Maxson BB, Fonseca RJ (1990) Evaluation of anterior maxillary alveolar ridge resorption when opposed by the transmandibular implant. J Oral Maxillofac Surg 48: 1283-1287.

17. Jacobs R, van Steenberghe D, Nys M, Naert I (1993) Maxillary bone resorption in patients with mandibular implant-supported overdentures or fixed prostheses. J Prosthet Dent 70: 135-140.

18. Henry PJ, Bower RC, Wall CD (1995) Rehabilitation of the edentulous mandible with osseointegrated dental implants: 10-year follow-up. Austr Dent J 40: 1-9.

19. Lechner SK, Mamnen A (1996) Combination syndrome in relation to osseointegrated implant-supported overdentures: A survey. Int J Prosthodont 9.

20. Thiel CP, Evans DB, Burnett RR (1996) Combination syndrome associated with a mandibular implant-supported overdenture: A clinical report. J Prosthet Dent 75: 107-113.

21. Kreisler M, Behneke N, Behneke A, d'Hoedt B (2003) Residual ridge resorption in the edentulous maxilla in patients with implant-supported mandibular overdentures: An 8-year retrospective study. Int J Prosthodont 16.

22. Maxson B, Powers M, Scott R (1990) Prosthodontic considerations for the transmandibular implant. J Prosthet Dent 63: 554-558

23. Jacobs R, Schotte A, van Steenberghe D, Quirynen M, Naert I (1992) Posterior bone resorption in osseointegrated implant-supported overdentures. Clin Oral Implant Res 3: 63-68.

24. Gupta S, Lechner SK, Duckmanton NA (1999) Maxillary changes under complete dentures opposing mandibular implant-supported fixed prostheses. Int J Prosthodont 12: 492-497.

25. Tymstra N, Raghoebar GM, Vissink A, Meijer HJ (2011) Maxillary anterior and mandibular posterior residual ridge resorption in patients wearing a mandibular implant-retained overdenture. J Oral Rehabil 38: 509-516.

26. Palmqvist S, Carlsson GE (2003) The combination syndrome: A literature review. J Prosthet Dent 90: 270-275.

27. Sülün T, Şakar O, Bilhan H, İspirgil E (2012) The effect of mandibular anterior teeth on the hypermobile tissue in the anterior part of the maxilla. Arch Gerontol Geriatr 55: 12-15.

28. Wictorin L (1964) Bone resorption in cases with complete upper denture. Acta Radiol (Stockholm) Suppl 228.

29. Schmitt SM (1985) Combination syndrome: A treatment approach. J Prosthet Dent 54: 664-671.

30. Jameson WS (2001) The use of linear occlusion to treat a patient with combination syndrome: A clinical report. J Prosthet Dent 85: 15-19.

31. Jameson WS (2003) Various clinical situations and their influence on linear occlusion in treating combination syndrome: A discussion of treatment options. Gen Dent 51: 443-447.

32. Peñarrocha M, Viña JA, Carrillo C, Peñarrocha D (2012) Rehabilitation of reabsorbed maxillae with implants in buttresses in patients with combination syndrome. J Oral Maxillofac Surg 70: e 322-30.

33. Piermatti J (2013) Rehabilitation of the edentulous maxilla complicated by combination syndrome with an implant overdenture: A case report. Gen Dent 64.

34. Carlino P, Pettini F, Cantore S, Ballini A, Grassi FR, et al (2014) Surgical and prosthetic rehabilitation of combination syndrome. Case Rep Dent.

35. Hansen CA, Jaarda MJ (1990) Treatment alternatives for a modified combination syndrome. Gen Dent 38: 132-137.

36. Gates WD, Scurria MS, Terry BC (1994) Management of the maxilla after alveolar ridge augmentation with hydroxylapatite when opposed by mandibular implants. J Prosthodont 3: 62-64.