

Case report: orthodontic management of patient with multiple missing teeth and canine substitution.

María Fernanda Federico Ruiz¹, Daniel Cerrillo Lara², Josué Villegas³, Miguel Ángel Ramírez⁴, Alicia Percevault Manzano⁵

¹(Orthodontic Specialty, Universidad Autónoma de Baja California, México)

²(Orthodontic Specialty, Universidad Autónoma de Baja California, México)

³(Orthodontic Specialty, Universidad Autónoma de Baja California, México)

⁴(Orthodontic Specialty, Universidad Autónoma de Baja California, México)

⁵(Faculty of Odontology, Universidad Autónoma de Baja California, México)

Abstract:

Background: The selection of the treatment protocol for a patient with multiple dental agenesis will depend on many factors, being relevant the number of missing teeth, the age and economic solvency of the patient.

Case Report: A 14 year old male patient was taken to the Orthodontics Department of the Autonomous University of Baja California (UABC), Mexico, asking for orthodontic treatment. Taking in consideration the results of the different established analyses, a skeletal class II was diagnosed. The replacement of lateral incisors with canines, as well as rehabilitation with implants, is a treatment aimed at restoring both functionality and esthetics in patients with dental agenesis and should be treated by an interdisciplinary team.

Results: Dental class I is achieved, lip competence, facial harmony, class I molar relationships, and the patient satisfaction.

Conclusion: Canine replacement and dental implants can be used effectively in the treatment of multiple congenital absences. Both treatment options have remained stable in the patient presented here, without causing periodontal alterations or dysfunction in the temporomandibular joint.

Key Word: Orthodontic, Agenesis, Canine substitution.

Date of Submission: 18-09-2022

Date of Acceptance: 03-10-2022

I. Introduction

The congenital absence of some dental organs is an anomaly that, with the passage of time, has been increasing in frequency, being observed with greater regularity in patients in clinical practice.[1] The treatment of patients with dental agenesis is aimed at restoring both functionality and esthetics and should be carried out by an interdisciplinary team.

Dental agenesis is the most common anomaly of dental development. The term dental agenesis is used to describe both congenital dental absence due to a variety of syndromes, as well as missing or absent teeth that have a genetic but not a syndromic cause.[2]

The absence of dental organs can occur in any dental arch, with greater repercussion on the permanent dentition. The condition of dental agenesis seems to be more frequent in the last teeth of each group, being these the lateral incisors, second premolars and third molars, being rare the absence of canines. The dental organ with the highest prevalence of agenesis is the lower third molar, with the lower second premolars being the next most frequent, followed by the maxillary lateral incisors. Agenesis generates both esthetic and functional problems, so its detection during primary or mixed dentition helps to make a good therapeutic planning to successfully correct this problem.[3]

It is generally reported that the prevalence of agenesis in the permanent dentition increases with time and varies between 1.6% and 36.5% depending on the population investigated. In Latin America, it has been shown that the frequency of dental agenesis oscillates around 5.75% of the population, excluding the third molar, affecting more women than men. The most common missing tooth is the lower second premolar followed by the upper lateral incisors. Bilateral agenesis is frequently seen in upper lateral incisors, while unilateral agenesis is more frequently seen in the lower second premolars [4].

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It is frequent that when only one lateral incisor is absent its counterpart presents an anomalous form (peg or microdontia). The anomalous shape in the lateral incisors is often related to the displacement of the canines towards the palate or other regions far from their natural position, so the clinician often has to deal not only with dental agenesis but also with impacted canines.

When treating unilateral agenesis, you should take care and ensure the correct positioning of the dental midline with the facial midline, so in certain circumstances it is decided to perform exodontia of the dental organ contralateral to the absent one in order to achieve this objective.

Treatment options in the absence of the second premolars

When presenting patients with retained second primary molars and congenital absence of the second permanent premolars, several alternative treatments can be chosen, such as the maintenance of the second primary molar, spontaneous closure of the space by extracting the second primary molar before the eruption of the first permanent molar, space closure with controlled wear of second primary molar, orthodontic space closure after extraction of second primary molar, autotransplantation, implant replacement, conventional fixed bridge and resin-bonded bridge.[5]

Keeping the primary tooth as long as possible will help preserve the alveolar bone for subsequent prosthetic rehabilitation of the area. If the space, profile, and intermaxillary relationships are acceptable or slightly protruded, it is possible to extract successorless second primary molars at 7-9 years of age and allow mesialization of the first molars. In this way a partial or even complete closure of the space can be achieved. Early extraction may reduce the duration of treatment when the missing second premolar space needs to be closed, although later orthodontic treatment will usually be required. Another option, already mentioned, for the absence of the second premolars consists of combining controlled cutting and partial extraction of the primary tooth with pulp treatment to favor the mesialization of the first permanent molar towards the space of the primary molar without alveolar bone loss due to an older extraction.[6]

Replacement of lateral incisors by canines

Conventional space closure for missing maxillary lateral incisors is a feasible and safe procedure that provides long-term satisfactory esthetic and functional results. Further improvements in tooth reshaping and positioning, progress in restorative treatment with individual tooth whitening and hybrid composite resin restorations demonstrate that quality treatment can be achieved when space closure is combined with esthetic dentistry. Space closure represents the best option when the incisors are protruded and the molars tend to have a class II relationship posteriorly, so reciprocal space closure between the anterior and posterior teeth can be used, resulting in easier advance the posterior teeth of the upper arch. Closing the space is usually avoided when patients have a complete class I or trend towards a class III as there is the possibility of producing an anterior crossbite by retracting the incisors to close the space. Unilateral orthodontic space closure in the anterior region of the mouth is generally discouraged. In case of unilateral absence of a lateral incisor, it may be necessary to extract the other lateral incisor before the canines erupt, in order to enhance the drift pattern for the definitive closure of the space and the replacement of the teeth, especially when the remaining primary incisor is peg-shaped. The tendency of the space between the anterior teeth to reopen after space closure in a young patient is a disadvantage of this treatment option. [7,8]

Camouflage of upper canines to upper lateral incisors

In order to mimic the canines in the position of the lateral incisors, it is necessary to remove a lot of buccal, occlusal, interproximal and lingual enamel, as well as modify the gingival contour. The steps consist of interproximal reduction, flattening of the cusp, flattening of the buccal surface, reduction of the thickness of the cingulum, and finally rounding of the corners of the flattened crown. In some cases, the canine must be reconstructed with hybrid composite resin or ceramic veneers to achieve a suitable tooth color. The gingival margin, likewise, requires modifications, and these are achieved by performing an extrusion movement of the canine, in order to lower it approximately 0.5mm with respect to the gingival margin of the central incisor, and intrusion of the premolar, to place its margin. gingival at the same level or slightly above that of the central incisor. You can also choose to reshape the gingival margin either with a diode laser or conventionally with a scalpel. [2, 9, 10]

II. Material And Methods: Case Report

Male patient, 14 years, and 7 months old, presented to the Postgraduate and Health Research University Center (CUPIS) of the School of Dentistry, Tijuana Campus. In the anamnesis, the parents reported not having any systemic condition or being under any medical treatment that affects orthodontic results.



Fig. 1Initial facial photographs

In the extraoral analysis, he presented a mesoprosopic type of face, decreased upper facial third, convex profile, decreased nasolabial angle, obtuse mentolabial groove, lower lip 3.5 mm in front of Ricketts' aesthetic plane. His smile analysis shows 80% of the clinical crown, consonant smile with lower lip and upper midline deviated 3.5 mm to the right (Fig. 1).

In the radiographic analysis, 22 permanent teeth are observed in the mouth, 4 tooth germs corresponding to third molars, O.D. #11 retained, no O.D. #74, 13, 29, 20 in eruption process, asymmetric branch height, uniform bone density.

In the intraoral analysis, we observed that the patient presented a thick periodontal biotype without apparent pathological data, presented mixed dentition, triangular upper arch shape and square lower arch; right class II and left class I molar relationship, indeterminate canine relationship; 5mm horizontal overbite and 100% vertical overbite.



Fig. 2Intraoral photographs

Among the studies requested of the patient, there was a panoramic radiograph and a lateral skull radiograph (Fig. 3 and 3.1) in which the cephalometric tracing was performed, obtaining a diagnosis of a class II skeletal relationship, neutral growth pattern and short mandibular body relative to the anterior skull base. The results are attached in Table I.



Fig.3 Initial profile cephalometric radiograph

VALUES		
	Norma	Inicial
SNA	82°	84°
SNB	80°	78°
ANB	2°	6°
Áng 1s / SN	104°	91°
Ii / Go-Gn	90°	99°
Mandibular Length (Go-Me)	71 mm	72 mm
Anterior Cranial Base (S-N)	71 mm	70 mm
Mandibular Length / BCA	1:1	1:1
Go-Gn / SN	32°	33°
Witts	0 mm	-0.5 mm



Fig. 3.1 Initial panoramic radiograph

Table I

Treatment Due to the patient's agenesia, it was decided to perform conventional orthodontic treatment, leaving the corresponding spaces of the upper second premolars. It was decided to place a fixed appliance MBT slot 0.018". Upper alignment and leveling. Extractions of O.D. #10, 20, A, J and T. In steel archwires, lose upper anchorage leaving upper canines as lateral incisors and first premolars as canines, maintain the space of upper second premolars for future placement of dental implants, closing reciprocal spaces in the lower arch. Harmonize arches. Torque and settling of the occlusion. Prosthetic rehabilitation in the region of the upper second premolars. Upper and lower circumferential retention.

Treatment sequence

Having understood the limitations of orthodontic treatment with dental agenesia and mixed dentition, it was decided to cement the fixed appliance MBT 0.018 in upper arch not including temporary D.O. and D.O. #10 in conjunction with archwire 0.014 NiTi upper (Fig. 4).



Fig.4 Upper MBT appliance placement.

After a few months, it was indicated to perform the extraction of the O.D. #10,H, J, K and T. Subsequently, alignment and leveling was continued with 0.016 NiTiarchwires and traction with a chain was started on O.D. #11 (Fig. 5).



Fig.5 Traction of O.D. #11 with metal chain.

We started with 0.016 x 0.022 NiTi arches and placed O.D. #6 - #8 and #11 - #9 chain for gap closure. Then continue with 0.016 x 0.022 Steel arches and place O.D. #3 - #5 open-coil and O.D. #11 - #12 chain to move the upper midline to the left and O.D. #21 - #22 chain. Once the space closure and midline are formed, the O.D. #5 - #12 is spliced continuously (Fig. 6).

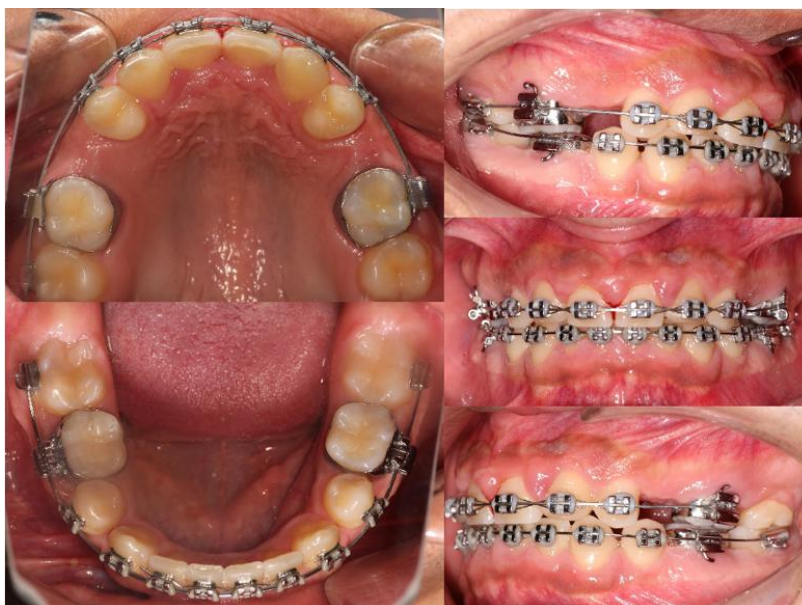


Fig.6 Midlines coincide and the upper arch is consolidated.

The consultation with the rehabilitator is performed and later the evaluation and planning for the placement of implants in the areas of O.D. #4 and 13. Subsequently, interproximal wear is performed between O.D. #24 and #25 and elastic chain is placed from O.D. #5 - #12 and from #19 - #30 (Fig. 7). The surgical phase is continued for the uncovering of implants and a scar is placed (Fig. 8).

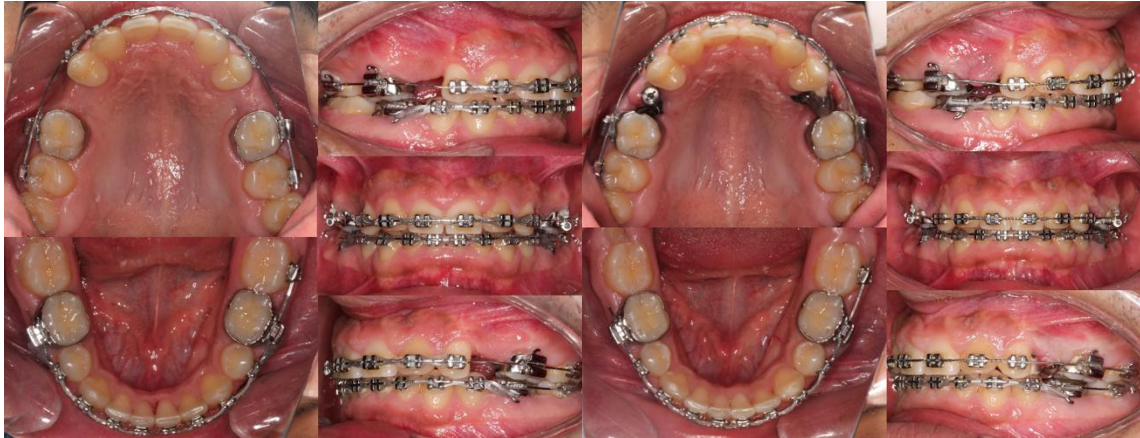


Fig. 7 Upper and lower elastic chain.

Fig. 8 Continuous Metal ligature of D.O.#6 - #11 and elastic ligature of D.O.#19- #30.

The upper appliance was removed and a temporary thermoformed retainer was placed (Fig. 9). Elastic chain of D.O. #19 and #30 is placed. Subsequently, the osseointegration test of implant #4 and #13 is carried out. The final crown try-in and adjustment is performed (Fig. 10).

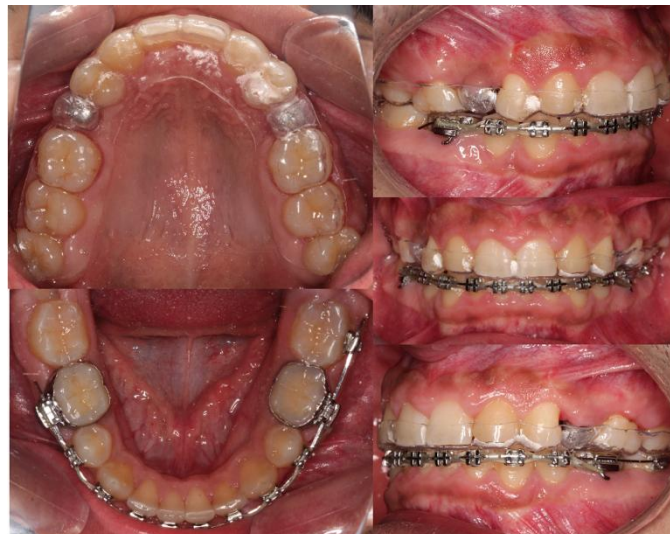


Fig. 9 Removal of upper appliance and placement of retainer.

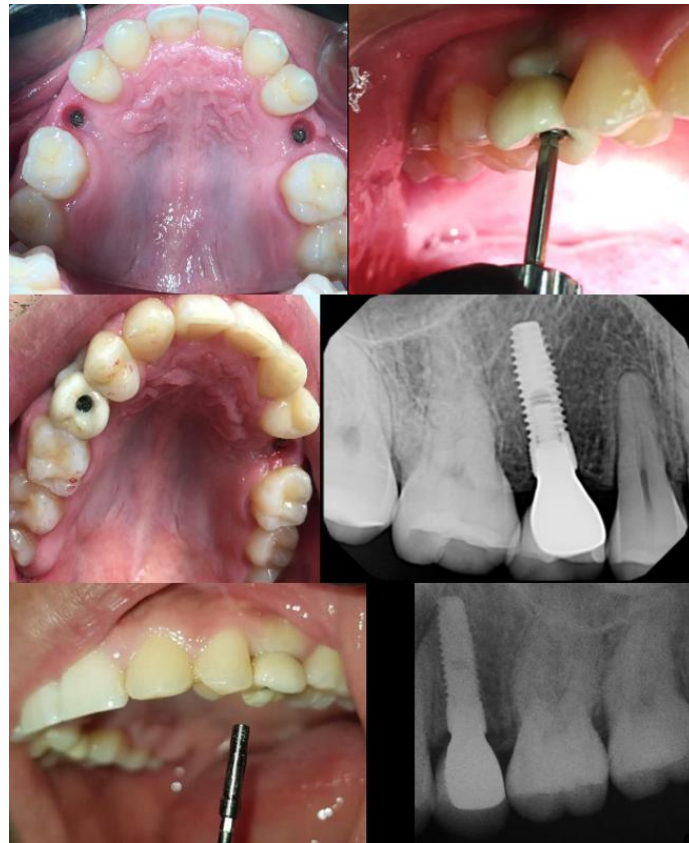


Fig. 10 Testing and setting of final crowns.

The removal of the lower appliances is authorized and the placement of lower circumferential retainer and upper essix is performed.



Fig. 11 Final intraoral pictures.

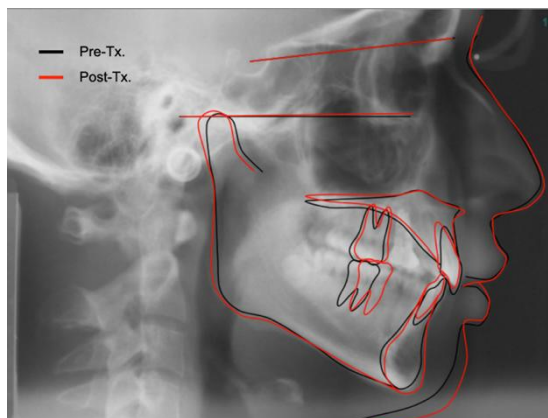


Fig. 12 Lateral skull radiograph with superimposition on skull base.

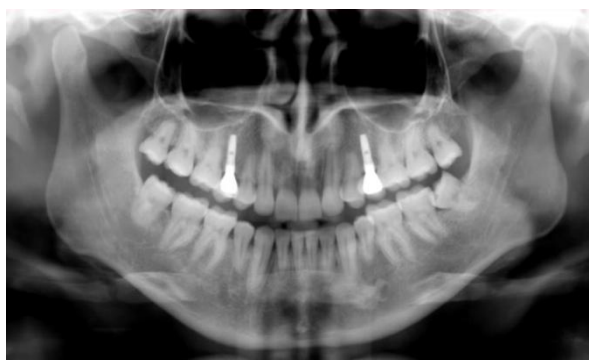


Fig. 13 Final panoramic radiograph.



Fig. 14 Final facial photographs.

III. Result

Comparing the initial photographs with them, we see how the objectives set at the beginning of the treatment were met. In the lateral intraoral photographs, we observed how class I molar relationships were followed, how the correct placement of dental implants was carried out at the site of the missing upper second premolars, as well as the mesialization of the upper first premolars at the canine site. In the front photograph we can see how the substitution of the lateral incisors for the canines will be modified, which will obtain a modification in their shape, through the reduction of enamel, to ensure good mimicry or aesthetics and functionality. Correction of a vertical and horizontal overbite becomes apparent.

In the occlusal photographs we can see how the shape of the arches changed to more harmonic and symmetrical ones, the upper arch changed from a triangular to an ovoid shape, while the lower one from a quadrangular to an ovoid one, the crowding present in this lower arch was resolved satisfactorily. Regarding periodontal health, it remained stable throughout the treatment.

In the extraoral photographs from the front we see how there is now lip compatibility without the presence of contraction of the chin muscles. The dental midlines coincide with the facial midline. By presenting a low smile line from the beginning, it helps us to hide the zenith of the lateral incisors (before canines), which were slightly higher compared to that of the central incisors.

The patient treated in this case was very satisfied with the results obtained and this was achieved thanks to the fact that the diagnosis and treatment plan was carried out jointly between the rehabilitator and the orthodontist from the beginning.

IV. Discussion

Few orthodontic cases have been reported involving multiple dental absences not related to syndromes. Biggerstaff in 1992 [11] reported a case in which a 12 year old male patient presented agenesis of the lateral incisors and upper second premolars, so it was decided to perform canine substitution, that is, to place the canines in the place of the absent lateral incisors and the premolars in the position of the canines. In order to solve the absence of the second premolars, it was decided to leave the second primary molars in place. On certain occasions this becomes a problem and the author takes this into account, mentioning that the stability of the occlusion will depend on the longevity of the roots of the primary molar, which were not reabsorbed during the active orthodontic treatment.

The long-term stability, functionality and esthetics of canine replacement is reported. Almeida et al. [8] present a case of canine substitution with a follow-up of 14 years, in this patient the aforementioned characteristics were maintained and it is demonstrated how with the help of restorative dentistry the canines perfectly mimic the place of the lateral incisors resulting in a harmonious smile.

The patient treated multidisciplinary in the present article has some clinical characteristics similar to the clinical case reported by Biggerstaff [11], likewise, the follow-up performed is similar, with the exception that in the present case the extraction of the primary dental organs was performed in order to subsequently place implants.

During the treatment planning it was considered the possibility of restoring the upper left lateral incisor with a peg shape and open the space for the placement of an implant on the right side where the agenesis was present, however, due to the close impactation of the upper left canine on the lateral and the mentioned in different literature reports [7,12] about certain risk of gingival recession in implants placed in the anterior zone, it was decided to perform the extraction of the lateral incisor with shape anomaly and perform a canine substitution in the maxillary anterior zone.

Some studies such as that of Almeida et al. [8] and Rosa et al. [13] conclude that canine substitution is a good option for treating agenesis of lateral incisors since it does not cause periodontal problems or any type of dysfunction in the temporomandibular joint. This is proven in this treatment as the periodontium remains stable during the whole treatment, even during the retention time, likewise the patient has not presented or referred any alteration at the temporomandibular joint level.

Although the periodontium did not suffer any type of pathology, it is evident that the final placement of the gingival margins of the upper canines is not completely optimal, since as reported in the work of Brough et al.[14] it is more esthetic to place these margins 0.5 mm below the gingival margin of the central incisors, however, thanks to the fact that the smile line of the patient is low, it helps to hide the elevated position of the gingival margins of the canines.

Due to the fact that in the upper arch the patient also presented agenesis of the second premolars, it was decided to maintain the space for the later rehabilitation with implants as presented in the case reported by Sabri [15], this procedure has the intention of maintaining the facial height since the mesialization of the posterior sector to achieve the closure of spaces will rotate the mandible in a counterclockwise direction decreasing the facial height. Placing dental implants in the posterior area does not affect esthetics if there is any periodontal alteration [7].

V. Conclusion

In cases of multiple missing teeth, interdisciplinary work is recommended, as was done in the present case involving the orthodontist and the oral rehabilitator. Being part of a team with different specialists helps to ensure the success of the treatment.

Both canine replacement and dental implants can be used effectively in the treatment of multiple congenital absences. Both treatment options have remained stable in the patient presented here, without causing periodontal disturbances or temporomandibular joint dysfunction. In situations of unilateral congenital absence, caution should be exercised when attempting to close spaces without removing a dental organ from the contralateral quadrant, as there may be a significant deviation of the midline during treatment, resulting in an unsightly appearance that the patient may perceive.

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María Fernanda Federico Ruiz, et. al. “Case report: orthodontic management of patient with multiple missing teeth and canine substitution.” *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, 21(10), 2022, pp. 22-31.