CASE REPORT
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Various aspects of two treatment approaches to patients with problems of hypodontia of upper lateral incisors

Različiti aspekti dva terapijska pristupa kod pacijenata sa hipodoncijom gornjih lateralnih sekutića

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Abstract

Introduction. The treatment of hypodontia of the upper lateral incisors could be orthodontic or multidisciplinary with combined orthodontic, surgical and prosthetic involvement. Both options have their *pros* and *cons*. They could be quite challenging to manage, particularly in the cases of unilateral missing of the upper lateral incisor in adult patients. We presented two cases with these different treatment approaches in young adult patients with unilateral missing of upper lateral incisors. **Case report**. The first case presents a combined orthodontic, surgical and prosthetic treatment of the missing upper right lateral incisor in an adult patient. Our clinical examination of a 22-year-old girl showed her missing tooth 12 with almost completely closed space, midline deviation, reduced overjet and overbite, Class III molar relationship on the right side and Class I molar relationship on the left side with V-shape maxillary arch and crossbite tendency in the frontal region. Based on the skeletal Class III relationship and intraoral findings, it was decided to open the space for tooth 12 and to establish the overjet, overbite and Class I occlusion as well. A surgical implant insertion followed the orthodontic preparation, with crown positioning after surgical healing. The second case described the orthodontic treatment of unilateral hypodontia in a young adult patient. Clinical and radiographic examinations of a 24-year-old female revealed hypodontia of tooth 12 with microdontic conical tooth 22 with severe crowding in the lower arch, Class I molar relationship on the right side and half-Class II relationship on the left side. The treatment decision was to extract atypical tooth 22, teeth 35 and 44 and to move the upper teeth forward to close the space. After the orthodontic treatment, upper canines were mesially moved to replace those missing lateral incisors. **Conclusion.** Both treatments successfully resolved malocclusion and obtained solid aesthetic and functional results. The treatment plan and decision to open or close the space in a case of hypodontia should be made individually for each patient according to their age, malocclusion, canines' shape and size and patient preferences.

Key words:
anodontia; dental implants; incisor; malocclusion; orthodontics; orthodontics, corrective.

Apstrakt

Uvod. Terapija hipodoncije gornjih lateralnih sekutića može biti ortodontska ili kombinovana, uključujući ortodontsku, hirurško i protetsku terapiju. Oba terapijska pristupa imaju svoje prednosti i nedostatke i mogu biti veoma zahtevni za terapeuta, naročito kod odraslih pacijenata sa jednostranim nedostatkom gornjeg lateralnog sekutića. Prikazana su dva različita terapijska pristupa kod mladih odraslih osoba sa jednostranim nedostatkom gornjeg lateralnog sekutića. **Prikaz bolesnika.** Prvi slučaj predstavlja kombinovanu ortodontsko-hirurško-protetsku terapiju kod mlade odrasle osobe ženskog pola, starosti 22 godine, kod koje je kliničkim pregledom ustanovljen nedostatak zuba 12 sa potpuno zatvorenim prostorom, pomerenom sredinom gornjeg zubnog niza, smanjenim incizalnim razmakom i preklopom, interkuspidacijom molara III klase sa desne strane i I klase sa leve strane, V oblika gornjeg niza, uz postojanje tendencije ka obrnutom preklopu sekutića. Na osnovu skeletnog odnosa III klase i intraoralnog nalaza, odlučeno je da se otvori

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prostor za zub 12 i koriguje incizalni razmak i preklop uz uspostavljanje okluzije I klase. Nakon ortodontske pripreme, postavljen je implant u zoni zuba 12 sa krunicom nakon završene faze hirurškog zarastanja. U drugom slučaju opisan je ortodontski tretman kod mlade odrasle ženske osobe, starosti 24 godine, sa jednostranom hipodoncijom lateralnog sekutića. Kliničkim i radiografskim pregledom ustanovljen je nedostatak zuba 12, sa mikrodontnim koničnim zubom 22, izraženom teskobom u donjem zubnom nizu, interkuspidacijom molara I klase sa desne strane i polu-II klase sa leve strane. Ortodontskom terapijom, uz ekstrakciju zuba 22, 35 i 44, korigovana je postojeća malokluzija, uz mezijalno pomeranje gornjih očnjaka na mesto lateralnih sekutića. **Zaključak.** Primenom oba terapijska pristupa, postignuti su zadovoljavajući estetski i funkcionalni rezultati i uspešno je korigovana malokluzija. Odluka o terapijskom pristupu treba da bude individualna, zasnovana na uzrastu, malokluziji, obliku i veličini očnjaka kao i željama samog pacijenta.

Ključne reči:
bezubost; implanti, stomatološki; sekutići; malokluzija; ortodoncija; ortodoncija, korektivna.

Introduction

A restorative treatment in hipodontia cases can be significantly facilitated by an orthodontic treatment. Orthodontic management of these patients includes many procedures – from space management, uprighting and aligning teeth to retention and stability of the whole treatment [1–6].

There are various terms for the reduction in the number of teeth which are used in bibliography, such as teeth absence, aplasia of teeth, congenitally missing teeth, agenesis of teeth, oligodontia. The most commonly used term is hypodontia, which in general sense refers to the absence of a smaller number of teeth. The phenomenon of 1 to 2 absent teeth has been found in 80% of cases, while agenesis of 4 or more teeth can occur in 10%. Severe oligodontia can appear in 1% or fewer cases [7–15]. In the period between 1936 and 2002, according to a meta-analysis by Polder et al. [16], missing teeth were more prevalent in Europe and Australia than in North America. The absence of teeth is more frequent in permanent teeth. In the upper jaw, the missing tooth is the last tooth of any given type, and it usually affects the upper lateral incisors. The absence of a primary tooth means that the same permanent one will be missing as well.

During the early stages of tooth formation, disturbances can result in hypodontia, which could be a part of a syndrome (Down syndrome, Rieger and Book syndrome [17–19]), could occur in patients with clefts [20–22] or could be an isolated occurrence [23–25]. The last-mentioned case can be either familial or sporadic. Studies have shown that the concordance rate for monozygotic twins is significantly higher than for dizygotic ones [26–28]. The polygenetic inheritance pattern is found in the cases of missing teeth [29]. Some patients do not have any hereditary history while others do have due to a combination of genetic and environmental factors [30]. Males and females are not equally affected by the absence of some teeth. Namely, in females there is an association between missing teeth and microdontia, while on the other hand, hyperdontia occurs more frequently in males and can be connected with macrodontia [31–32]. The problems of missing teeth can be more or less accompanied with a lesser or greater degree of impacted canines or with the transposition of canine and first premolar and taurodontism [33].

The treatment of patients with hypodontia must be seriously planned and sometimes within an interdisciplinary team. The orthodontic treatment plan may involve two different therapeutic approaches concerning space opening or closing, each one having its own separate criteria. All decisions with all their benefits could show some negative aspects [34–36].

The first option of opening the space, according to some authors, is the ideal functional and occlusal choice since it allows the perfect position of the canines. The negative side of this approach can be the prolonged treatment time and also the higher cost of the total treatment because of the use of implants along with crowns. Also, younger patients have to wait until the age of 18 before the implant procedure can be done [37–41].

On the other hand, the second choice is not as easy as it might appear. Closing the extra free spaces can be slow because of a reduction of the alveolar bone. Furthermore, the negative aspect of this option could lie in the difference in appearance of the canines compared to the adjacent teeth as they are usually pointed, darker, and wider. Many patients tend to choose this option due to the significantly lower cost of the total treatment [42–51].

There are two choices of retention in these cases: a removable or bonded retainer. Which type of retainers will be selected depends on many considerations, such as the age of the patients, i.e. in younger patients the removable retainer is preferred, while in the others, the lingual bonded retainer is a good option [52–54].

We present two different treatment approaches in cases of uni/bilateral incisor hypodontia: the first case was treated with a multidisciplinary approach, while the second one was treated only orthodontically.

Case report

Case 1

A female patient, Caucasian, 22-year-old, was presented due to chief complaints: disturbed aesthetic of the smile mainly due to certain midline asymmetry, limited occlusal contact in the anterior area and sporadic facial pain though her medical history was negative and there was no abnormal lifestyle detected. The patient had regular dentistry controls, orthodontic treatment with removable appliances

from age 8 to 13. The dentist referred the patient for an orthodontic evaluation.

The extraoral examination showed a dolichofacial pattern, slight mandibular asymmetry with a left shift and evidence of slight lateral black corridors during the smile. Her intraoral examination revealed a permanent dentition up to the second molars, absence of the right maxillary second incisor and completely closed space between teeth 11 and 13. The upper midline was deviated on the right side with V shape of the maxillary arch. There was some reduced overjet and overbite (edge to edge relationship) with a crossbite tendency in the front region. Class III molar and Class I canine relationship was present on the right side, Class I molar and Class II canine relationship on the left side and mild crowding in the anterior area of the lower arch (Figure 1).

The patient was 22 years old at the time of her first visit. Total treatment time, including interceptive and corrective phase, was 31 months.

Pretreatment records included lateral x-ray, panoramic x-ray both at initial stage and at the end of active treatment. An upper dentascan was performed at the end of the treatment to evaluate the bone condition for the implant substitution (Figure 2). Dental casts, cast analysis as well as the photographic documentation and aesthetic analysis were performed.

Treatment challenges were: recovery of the upper anterior aesthetic of the smile due to psychological impacts of previous orthodontic and prosthetic treatments, space reopening for tooth 12 that was completely closed, correction of occlusal relationship in a skeletal class III in an adult patient.

Objectives of the treatment were as following: correction of the occlusal relationships, both on the transversal and sagittal plane; acquisition of the adequate interradicular and interdental space for an implant substitution of tooth 12; upper arch expansion with a dentoalveolar expander type QH with the aim of coordinating the shape of the upper and lower arches, while the secondary objective was to gain elongation of the upper perimeter due to the lateral expansion (Figures 3a and 3b).

Application in both arches of a fixed appliance (MBT)

Fig. 1 – Intraoral features at the beginning of the whole treatment.

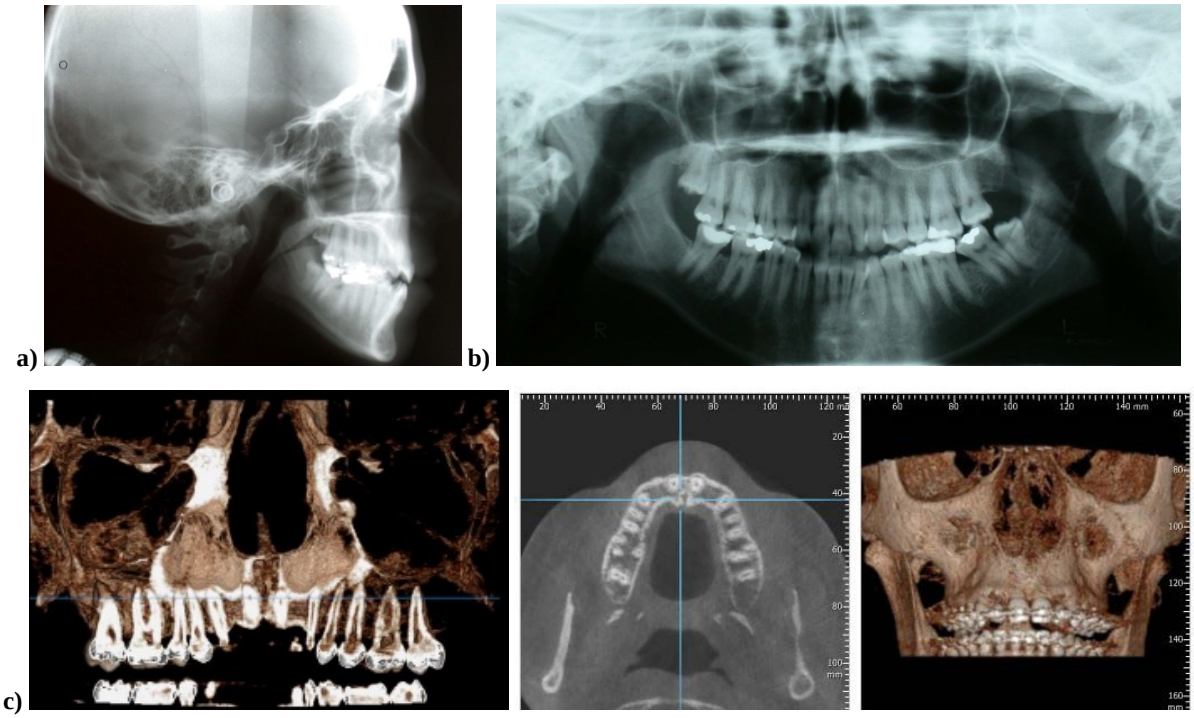

Fig. 2 – Pretreatment records: a) lateral x-ray; b) panoramic x-ray; c) upper Dentascan.

with conventional arch sequence was performed. Class III and intercuspation intraoral elastics were included. During the active phase, temporary prosthetic substitution of the lateral incisor was used with a single tooth bonded on the orthodontic arch (Figure 3c).

No changes of the treatment plan were made during the orthodontic therapy. The implant positioning required the choice of a small design of the implant due to the narrowed basal bone in the anterior area of the upper arch (skeletal class III malocclusion). Total orthodontic treatment time lasted 31 months with controls every 4th week (Figures 4 and 5).

The patient showed an optimal cooperation with a limited number of emergencies. The treatment plan was peculiar because of the adult age of the patient, the skeletal class III malocclusion with initial dysfunction signs and the complete closure of the 12 space requiring the extensive movement of the adjacent teeth to reach the correction of the malocclusion and implant positioning.

The presence of severe alteration on the sagittal and transversal plane of the upper arch in the adult patient needed a phase of correction with dentoalveolar expander and then a corrective treatment with braces and extensive usage of an intraoral elastic. A short period of retention was necessary to wait for the healing of the surgical phases.

The case illustrates a solution for a monolateral agenesis in an adult patient with corrective implant-prosthetic orthodontic treatment. The patient was satisfied with the aesthetic restoration of the smile (Figure 6).

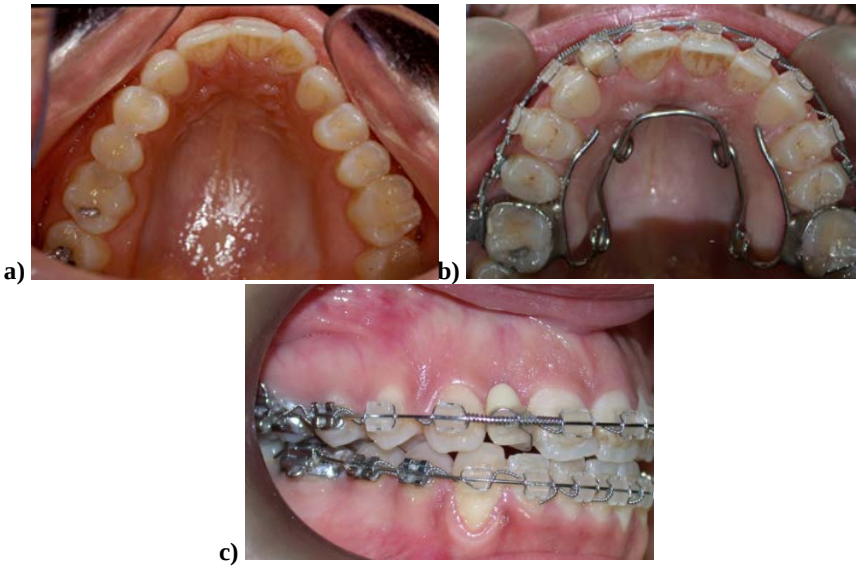

Fig. 3 – The upper arch: a) before the treatment; b) after the treatment with expander; c) temporary prosthetic substitution of the missing lateral incisor 12.

Fig. 4 – Patient at the end of orthodontic treatment – time for the implant replacement of the upper lateral incisor 12.

Fig. 5 – The end of orthodontic treatment (similarly to Fig. 4).

Fig. 6 – The results of the complete treatment.

Case 2

A Caucasian female 24-year-old patient was presented due to crucial complaints: asymmetric smile with atypical left lateral incisor and crowding in the lower arch. Her medical history was negative. The patient was referred for orthodontic treatment by her dentist.

Extraoral examinations showed slightly increased central third of the face in the frontal and lateral views, with a straight profile. Intraoral examinations revealed absent tooth 12, atypical tooth 22, severe crowding in the lower arch and both upper and lower dental arch midlines symmetrically deviated to the right in comparison to the midline of the face. Intercuspidation of the first molars on the right side was Class I, while on the left side her first molars were in the half-Class II. Intercuspidation of the canines on both sides were half-Class II. There was a crossbite in the contact area of teeth 13 and 43 (Figure 7a, 1–5).

A radiographic examination of the panoramic view showed the absence of teeth 12 and atypical 22 (Figure 7b). Our cephalometric analysis showed bimaxillary retrognathism with skeletal Class I by angle classification, with protruding lower central incisors. The dental cast analysis showed severe crowding in the mandibular arch with ectopic tooth 43 and Bolton discrepancy of the upper and lower dentition, with mandibular teeth too wide in comparison with the maxillary teeth.

Objectives of the treatment were to resolve the lower arch crowding and to place the ectopic 43 within dental arch, to correct both midlines to facial midline, to establish a symmetry of the smile line and Class I molar and canine relationship on both sides. Due to the lip competence and balanced profile, canines' shapes and sizes, it was decided to extract atypical tooth 22, and to move posterior teeth mesially to close the space, so that upper canines would replace upper lateral incisors. To resolve the crowding in the mandibular arch, it was agreed to extract teeth 44 and 35 on the left side because of the periapical lesion on the tooth 35 root.

This treatment started first in the upper arch with upper fixed appliance (Roth prescription). After the upper arch alignment and leveling, the lower arch was also included in the treatment. Because of the deep curve of Spee, leveling in the lower arch included a reverse curve of Spee arches. When the lower arch was leveled, space closing in both arches was done on stainless-steel wires. Having closed the space at the end, the patient was satisfied with the treatment outcome and her fixed appliance was removed (Figure 8). During the retention period our patient was instructed to wear removable plastic orthodontic retainers.

Total treatment time lasted 2 years and 5 months.

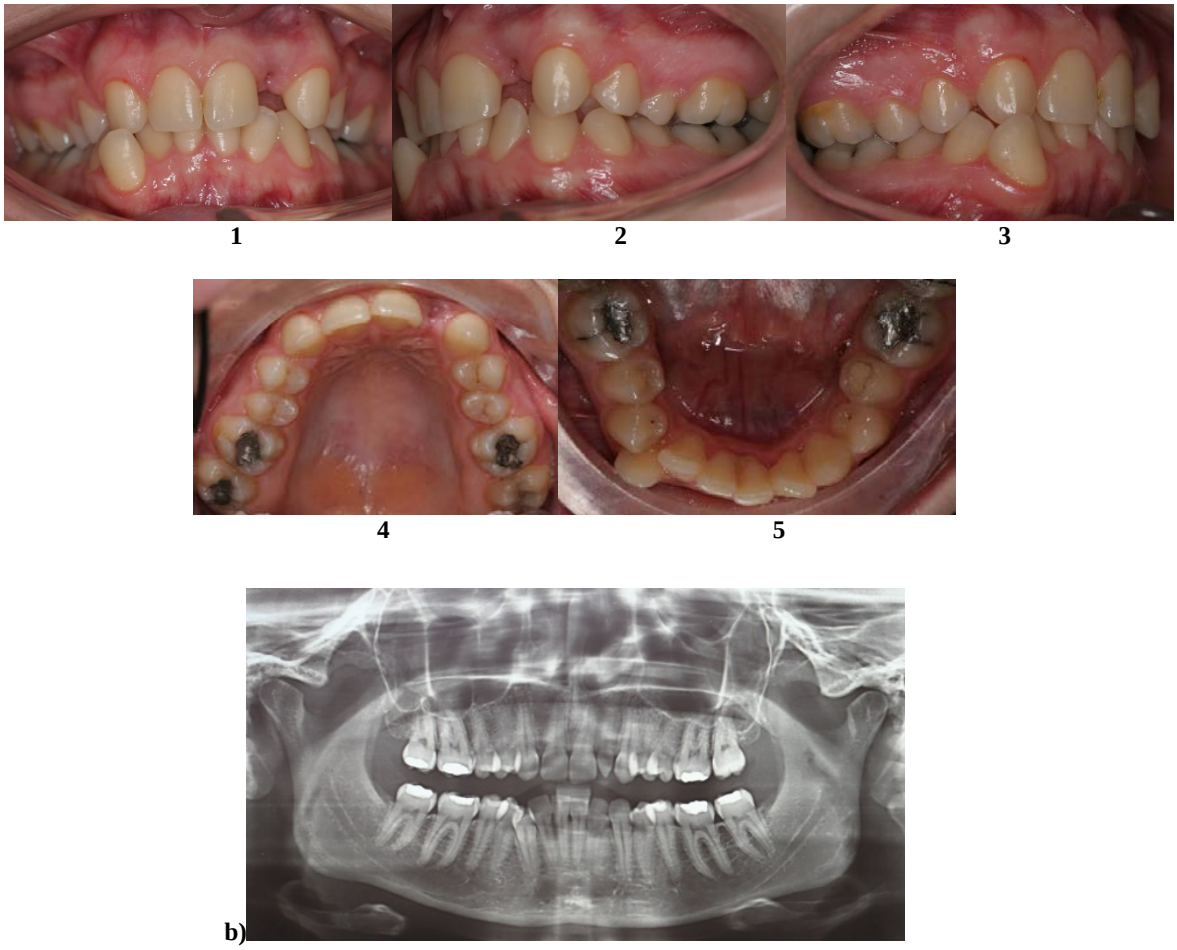

Fig. 7 –a, 1-5) intraoral photos of the second patient before the treatment; b) pretreatment panoramic view.

Fig. 8 – Final results of all goals and plans at the treatment completion.

Discussion

In cases with hypodontia of uni/bilateral lateral incisors, it is quite demanding to make an appropriate treatment plan to improve facial aesthetics, smile aesthetics and to rehabilitate oral functions.

In the first patient with skeletal Class III tendency toward anterior crossbite, our multidisciplinary treatment approach was presented. This decision was based on the collapsed and V-shaped upper arch, as well as on the narrowing especially in the anterior part. The upper arch expansion provided better arch shape and space for the missing tooth 12. As the space for the upper right lateral incisor was completely closed, it was decided to reopen it for the single tooth implant. Extensive protrusion of the upper incisors was avoided owing to the narrow basal bone in this area. Intermaxillary elastics were used during the orthodontic treatment to create the overbite, overjet and to resolve the malocclusion. In this case space opening provided not only implant preparation, but it was performed to correct the malocclusion.

The second patient had skeletal Class I with a balanced profile and lip competence. The shape and size of the canines' tooth crown, atypical tooth 22, severe crowding in the lower arch directed the treatment in the way of space closing and canine substitution of the lateral incisors and extractions of tooth 22, as well as of teeth 35 and 44. Following the orthodontic management, a restorative treatment was planned to reshape the crowns of the canines to achieve optimal aesthetic results. In this particular case, this female patient did not want any restorative treatment and was satisfied with the orthodontic treatment only.

Patients with unilateral missing upper lateral incisors could be quite challenging to treat. Unilateral hypodontia is usually accompanied with other intra-arch and inter-arch irregularities which makes the whole issue even more complicated.

Each treatment approach, with opening or closing the spaces, has its own advantages and disadvantages, so neither solution could prevail in clinical practice. According to Kokich and Kinzer [55] , there are three possible approaches: canine substitution, closing the space and creating the space for the implant or prosthetic replacement of the missing tooth. Comparing orthodontic and prosthetic approach, Kiliaridis et al. [56] and Bukvić et al. [57] have given the advantage to orthodontic treatment. Contrary to this, Rafałowicz and Wagner [58], concluded that an implant with porcelain-fused-to-metal crown, was the most effective treatment. How to reach the right decision and what to do within the problem of "space" depends on many factors such as: patient's malocclusion, profile, smile line, as well as on the color, shape and size of the adjacent teeth – the canines. The age of the patient influences the choice of the treatment, too. The period of early adolescence is the best time for it since the eruption of permanent canines can be controlled and at the same time the decision of closing or opening the space can be made.

Conclusion

The best solution for providing optimal results in the missing upper lateral incisor cases is the adequate individual decision plan, careful treatment management for achieving fine occlusion as well as satisfactory aesthetics and masticatory function. Some cases could be solved only by orthodontic management without any restorative treatment (as in our second case), while the first one needed the interdisciplinary team approach for achieving satisfactory results.

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