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TREATMENT OF MALOCCLUSION WITH SEVERE CROWDING AND MESIODENS TEETH USING THE PIGGYBACK TECHNIQUE ON STRAIGHT WIRE (CASE REPORT)

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ABSTRACT

Background: A malocclusion condition is accompanied by crowding due to a discrepancy between arch and tooth size. Piggyback technique in orthodontics to correct malposition teeth without disturbing the stability of the main arch. The aim of this case report is to guide clinicians in using the piggyback technique as a technique that can be used in treating cases of class I malocclusion accompanied by severe crowding without disturbing the stability of the main arch.
Case: A 22-year-old female patient with the main complaint of severe crowding of the anterior teeth. The analysis and diagnosis results showed Angle class I malocclusion accompanied by maxillary anterior crowding, rotation of teeth 11, 12, 13, palatally erupted ectopic maxillary second premolars, buccally erupted ectopic mandibular canine, and anterior-posterior mandibular crowding. There was a median line shift of 2 mm to the left, skeletal relationship class 1. Panoramic showed the presence of mesiodens tooth in the midline between the two central incisors, superficial caries on tooth 11, and caries reaching the pulp on tooth 26. All permanent teeth had erupted, and impaction on tooth 48. The piggyback technique used is by modifying two wires plus the use of an open NiTi coil spring, where some of the 0.012 NiTi flexible wire segments on the jaw arch are joined with SS 0.017 x 0.025 stiff wire throughout the segments.
Result: Treatment results showed corrected maxillary and mandibular crowding, rotation of teeth 11, 12, 13, palatally erupted ectopic maxillary second premolars, buccally erupted ectopic mandibular canine, overjet, corrected deep bite, and corrected mandibular median line shift. The profile improves, the patient's smile becomes more attractive with the teeth at good level and alignment and the facial profile becomes straighter.

INTRODUCTION

Good and regular tooth alignment contributes to the overall health of the oral cavity and the stomatognathic system in general. Malocclusion causes problems in the oral cavity that can disrupt a person's psychology and social life. The aim of orthodontic treatment is to correct the abnormal alignment of the teeth and jaw relationships so that normal occlusion can be achieved, better facial

aesthetics can be achieved, as well as to obtain harmony in facial shape, good masticatory relations and function, and stability in the final result.[7,8]

One of the most common malocclusion conditions is the presence of crowding or irregular teeth, which can trigger periodontal tissue problems. Crowding teeth are very difficult to clean by brushing teeth; this condition can lead to plaque accumulation, which is also one of the risk factors for calculus and gingivitis. The main common cause of malocclusion accompanied by crowding is the presence of a discrepancy between the arch of the tooth and its size.[4]

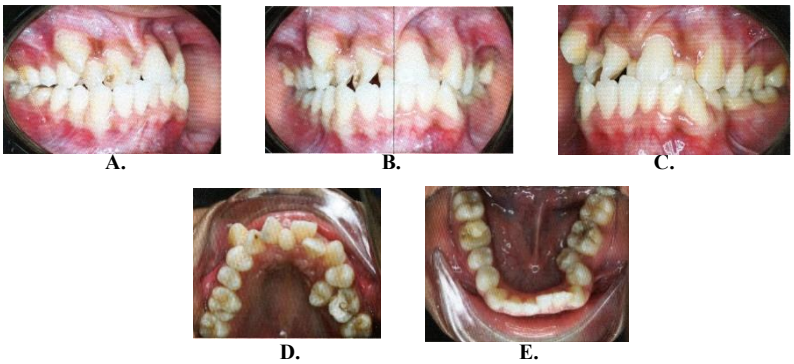
Some of the most sophisticated orthodontic procedures include piggyback techniques. Piggyback in orthodontics is used for using two wires. It is modified to correct dental misposition in the jaw arch without interfering with the stability of the main arch. This technique uses a primary wire made of stainless steel on one side and a sliding wire of nickel-titan on the other. This technique is quite effective in repairing a tooth misposition.[5] The purpose of this case report is to guide clinicians in the use of the piggyback technique as a technique that can be used to treat cases of class I malocclusion accompanied by severe crowding of teeth without disturbing the stability of the main dental arch.

CASE REPORT

A 22-year-old female patient wanted to straighten her teeth because she felt disturbed by the appearance of her maxillary and mandibular front teeth, which had been severely irregular since childhood. Dental history includes many deciduous teeth with cavities. Extra oral clinical photo before treatment (Figure 1) shows convex profile type, mesoprosop face type, mesocephalic head type, symmetrical face shape, incompetent lips, and the patient has no bad habits. Clinical intra-oral photographs before treatment (Figure 2) show normal oral mucosal tissue, a normal size of the tongue and hard palate, good oral hygiene with a moderate frequency of caries, and supernumerary teeth in the anterior area of the upper jaw. The patient had no complaints of pain in the jaw joint. The relationship of the first molar on the right is neutrocclusion, while on the left there is no relationship. The relationship of the canine on the right has no relationship, while on the left it is neutrocclusion. The curve of spee is flat; there is a shift of the median line on the lower jaw 2 mm to the left. Overjet 1 mm decreases, overbite 0 mm increases. Located in the anterior maxilla, posterior right, and left mandibles. There is protrusion of the maxillary teeth. The patient had never had orthodontic treatment before. The patient has a class I skeletal malocclusion with a proclined maxillary incisor inclination and a normal mandible. Patients with normal facial type, normal facial skeletal profile, normal maxillary incisor position relative to normal profile, and normal mandibular incisor inclination.

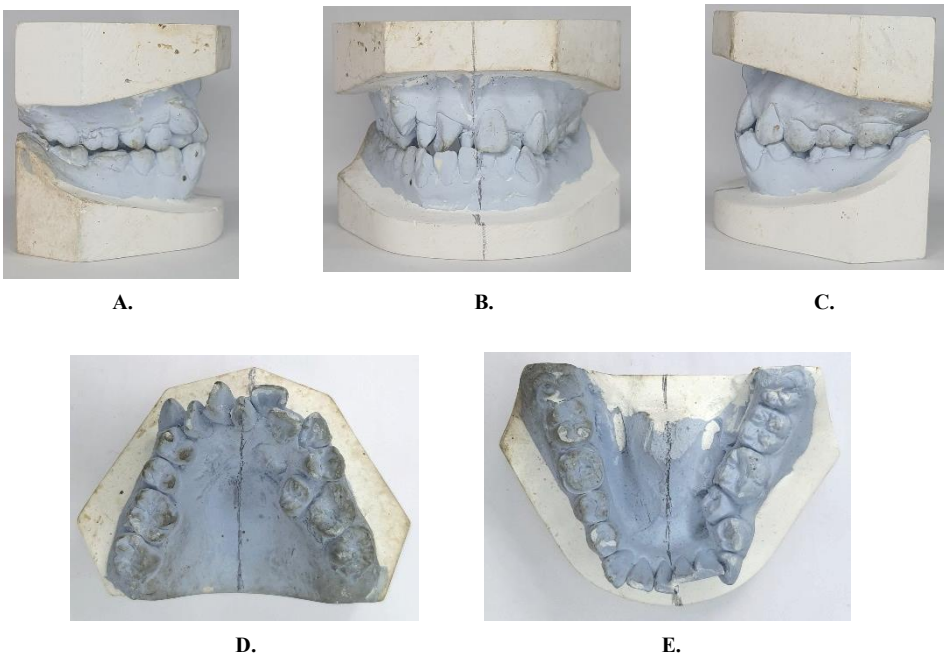
A. B. C.

Figure 1. Extra oral photos before treatment: A. Frontal facial photos; B. Frontal smiling face photo; C. Face profile.
(Source: personal documentation)



A. B. C. D. E.

Figure 2. Intraoral photo before treatment: A. Photo of teeth in right lateral view, B. Photo of teeth in frontal view, C. Photo of teeth in left lateral view, D. Photo of teeth in occlusal view RA, E. Photo of teeth in occlusal view in RB.
(Source: Personal documentation)



A. B. C. D. E.

Figure 3. Photo of the model before treatment: A. Photo of the right-side model, B. Photo of the model facing the front, C. Photo of the left side model, D. Photo of the RA occlusal model, E. Photo of the occlusal RB model.
(Source: Personal documentation)

Figure 4 shows the height and density of alveolar bone and periodontal tissue are within normal limits. Alveolar bone, maxillary sinus condition is normal. The right and left condyles and ramus are asymmetrically, the right and left mandibular ramus are the same height and the same width, the right and left mandibular bodies are the same length. There are supernumerary teeth between 11 and 21, superficial caries on tooth 11, and caries reaching the pulp on tooth 26. All permanent teeth have erupted, and there is impacted tooth 48.

Figure 4. Panoramic photo before treatment.
(Source: Personal documentation)

Figure 5: The results of the cephalometric x-ray analysis show a class I skeletal jaw relationship with the maxilla and mandible normal to the cranial base. The skeletal profile is normal. The growth of 1/3 of the face is at a slightly high angle with a normal facial growth pattern. Normal upper and lower incisors. The position of the upper and lower lips is behind the S - Line. The patient's diagnosis in this case was Angle class I malocclusion with severe upper anterior crowding, rotation of teeth 11, 12, 13, palatally erupted ectopic maxillary second premolars, buccally erupted ectopic mandibular canine, and anterior posterior mandible. There was a median line shift of 2 mm to the left, a class I skeletal pattern. The prognosis in this case is moderate because the patient has an abnormality in the tooth group with severe crowding in the anterior maxilla and posterior mandible right and left. However, the patient is still young and has high motivation for undergoing orthodontic treatment.

Figure 5. Lateral cephalometric photo before treatment
(Source: Personal documentation)

The treatment plan in this case is to carry out fixed orthodontic treatment with the MBT system with an extraction approach on supernumerary teeth, teeth 14, 26, 34, and 46. Based on space analysis, the space requirement in the maxilla is 16 mm, and in the mandible it is 12 mm. Orthodontic treatment begins (Figure 6) with the following steps for the maxilla: installation of a fixed appliance Pre-adjusted slot 0.022 MBT, buccal tube slot 0.022 MBT at 16, 17, 26, and 27, then unravelling with double wire (piggy back) NiTi 0.012 and SS 0.016 + open space with an open coil spring. Levelling and aligning with NiTi 0.012 and continuing until the wire reach the NiTi size of 0.016 x 0.022. Retraction of the anterior area was carried out using elastomer chains at 13, 12, 11, 21, 22, and 23. On 13, 23, 25, and 26, figure eight is done with ligatures. Meanwhile, the steps for the mandible are as follows: installation of the fixed appliance pre-adjusted slot 0.022 MBT, buccal tube slot 0.022 MBT at 37, 38, 46, and 47, then unravelling with NiTi 0.012. Levelling and aligning with NiTi 0.012 and continuing until the wire reach the NiTi size of 0.016 x 0.022. Correction 35 with wire-bending L loop 0.016 round, 0.016 x 0.022, stopper at distal 37 and 47. Anterior retraction using elastomer chains at 33, 32, 31, 41, 42, and 43. At 33, 43, 45, and 46, figure eight is done with ligatures. Maxillary and mandibular arch coordination using SS 0.016 x 0.022. Evaluation of posterior maxilla and mandible interdigitation was carried out at the finishing detailing stage with 0.016 x 0.022 SS wire.

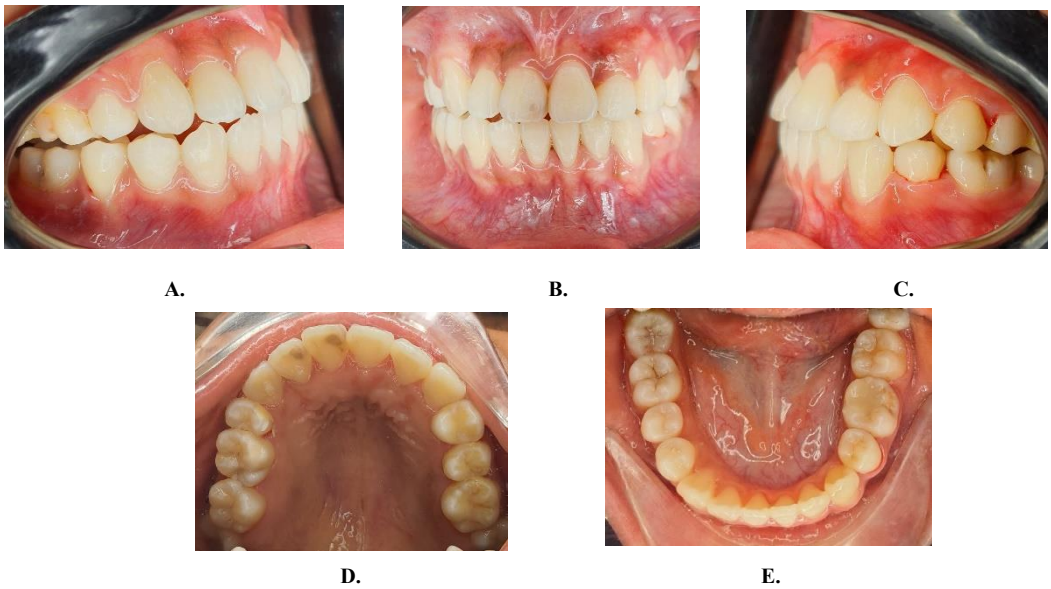
Figure 6. Unravelling stages with double wire (piggyback) NiTi 0.012 & SS 0.016 + open space with open coil spring. (Source: Personal documentation).

Treatment results after 27 months of treatment include all treatment plans. Maxillary and mandibular crowding corrected, rotation of teeth 11, 12, 13, palatally erupted ectopic maxillary second premolars, buccally erupted ectopic mandibular canine corrected, overjet corrected, deep bite corrected, mandibular median line shift corrected, facial profile improved, patient's smile more attractive with alignment The teeth are at good level and alignment, and the facial profile becomes straighter. The retention stage is carried out by installing retainers on the maxilla and mandible with a vacuum-formed retainer. Patients are instructed to wear the retainer for a minimum of 22 hours per day (except during eating and brushing teeth). Patients are instructed to evaluate the results of treatment and maintain oral hygiene. A post-treatment extraoral photo showed improvement in the patient's facial profile (Figure 7). Post-treatment intraoral photographs also showed satisfactory tooth

alignment, class I right and left canine relationships, and normal overjet and overbite. The midlines of the upper and lower jaws were in line with the midline of the patient's face (Figure 8).

A. B. C. D.

Figure 7. Extra oral photos after treatment, A. Frontal facial photos, B. Frontal smiling facial photos, C. 45° lateral facial photos, D. Profile facial photos. (Source: Personal documentation)



A. B. C. D. E.

Figure 8. Intraoral photo after treatment, A. Photo of teeth in right lateral view, B. Photo of teeth in frontal view, C. Photo of teeth in left lateral view, D. Photo of teeth in occlusal view RA, E. Photo of teeth in occlusal view in RB.
(Source: Personal documentation)

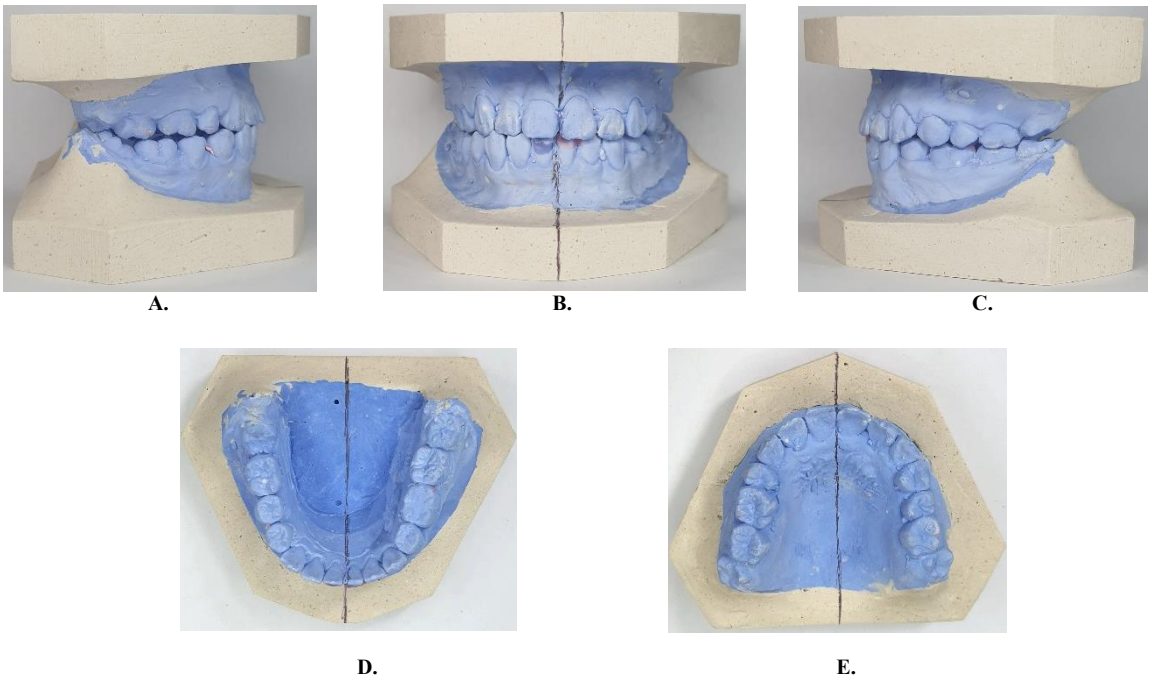


Figure 9. Photo of the model after treatment: A. Photo of the right lateral model, B. Photo of the frontal view model, C. Photo of the left lateral model, D. Photo of the maxillary occlusal model, E. Photo of the mandible occlusal model.
(Source: Personal documentation)

Figure 10. Panoramic photo after treatment.
(Source: Personal documentation)

Figure 11. Cephalometric photo after treatment.
(Source: Personal documentation)

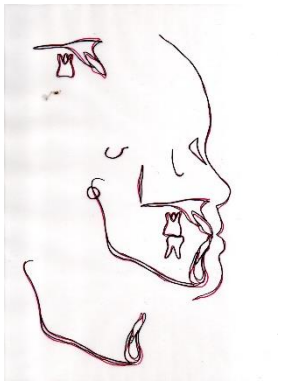


Figure 12. Superimposition: A. Before treatment (black); B. After treatment (red).
(Source: Personal documentation)

Table 1. Lateral cephalometric analysis before and after treatment

	Average	Before	After
Skeletal parameters (Horizontal)			
SNA	82°± 2°	84°	81°
SNB	80°± 2°	83°	81°
ANB	2°± 2°	3°	2°
Wits appraisal	F: 0(±2) M:1(±2)	AO < BO -10 mm	AO < BO -7 mm
Facial Angle	82°-95°	86°	85°
Angle of Convexity	-8,5°-10°	1,5°	-4°
Pg-NB	4mm ± 2	1 mm	2 mm
Skeletal parameters (Vertical)			
Y-axis	60°±6°	61°	62°
Occlusal plane - SN	14°	7°	9°
SN-MP	32°±3°	30°	28.5°
FMA	25°	23°	28.5°
Dental parameters			
Interincisal Angle	130°±10°	110°	119°
UI-SN	104°±6°	124°	118°
UI-NA	22°	39°	35°
UI-NA	4 mm±2	8.5 mm	7 mm
LI-NB	25°	30°	26.5°
LI-NB	2 mm±2	7.5 mm	5 mm
Pog-garis NB	2 mm	1mm	2 mm

Soft tissue parameters			
Upper lip-E line	2-3 mm	4 mm	3 mm
Lower lip-E line	1-2 mm	1 mm	0 mm

The results of cephalometric analysis before and after treatment have shown changes. This is in accordance with Couborne, 2015, who found that there are significant changes in horizontal skeletal parameters, namely points A and B in cephalometry, that can change due to orthodontic movements; SNA changes from 84° to 83° due to a change in point A; the angle of facial convexity changes from 1.5° to -4°; and changes in vertical skeletal parameters, namely the occlusal plane SN line changes from 7° to 9°. Significant changes occurred in dental and soft tissue parameters: UI-SN increased from 124° to 118°, the interincisal angle became more normal from 110° to 119°, UI-NA increased from 39° to 35°, and UI-NA withdrew linearly from 8 mm to 7mm. Soft tissue parameters also showed changes, namely that the upper lip E line was previously prominent from 4 mm to reduce to 3 mm, while the lower lip E line also showed a change from 1 mm to 0 mm according to the compensation treatment plan. Dental cephalometric parameters in this patient became normal, and the position and inclination of the upper teeth became more normal in accordance with the treatment goals, thereby reducing the convexity of the patient's face. Overall changes in these cephalometric parameters show that the skeletal pattern changes remain in class I. Changes occur due to changes in the inclination of the upper and lower anterior teeth to normal. The panoramic photograph (Figure 10) shows that the entire space after tooth extraction has been closed, and the roots of the teeth are parallel to each other. The total length of treatment is 24 months. The patient has agreed for his case to be published by signing an informed consent.

DISCUSSION

Treatment in this case is to use a modification of 2 wires plus the use of open NiTi coil springs where some segments of the 0.012 NiTi flexible wire on the jaw arch are joined to a 0.017 x 0.025 SS stiff wire on the entire segment, which aims in this case to correct malposition and crowding of the teeth, maxillary anterior teeth, namely 11 centric rotation, 12 centric rotation, 13 buccal ectopic, 21 labioversion, 22 palatoversion, 23 labioversion, and 25 palatal ectopic. The piggyback technique is an orthodontic technique that involves the modification of two wires, one wire made from flexible material, namely Nickel-Titanium, in a segment and one main wire made from rigid material, namely stainless steel, which aims to correct teeth that are malposition without disturbing the stability of the main dental arch.[5] This modification to the design of a two-wire appliance in one arch allows for bodily movement of the teeth. The resulting bodily movement of teeth occurs due to the position of the

brackets approaching the center of resistance. Niti 0.012 flexible wire can provide light and continuous force to produce physiological orthodontic tooth movement with minimal root resorption.[5,9,10] The technique with a modified design of an orthodontic appliance with two wires in one arch has also been proven to be successful in physically bringing the teeth palatally without any extrusive effects and without disturbing the anchorage.[6] Clinically, bodily sliding tooth movement cannot always be achieved due to moments that can cause tooth tipping and binding between the wire and bracket slots. The approach taken to obtain the tipping phenomenon is to apply a resistance load at a point that simulates the center of resistance of the tooth in clinical conditions.[3] The conventional approach is to use a smaller main arch wire that is flexible enough to use. The problem is that when the rotational force applied to the teeth creates undesirable movement of the teeth in the abutment teeth, braces are needed to realign all the teeth. The piggyback technique helps avoid this waste of time and resources.[1]

CONCLUSION

The piggyback technique can be used to correct malposition and crowding of the maxillary anterior teeth and fit the teeth into the arch. The result of using this technique is that it can correct the malposition of teeth 11, 12, 13, 21, 22, 23, and 25. The patient's skeletal pattern relationship showed no change in skeletal pattern.

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CONFLICT OF INTEREST

There is no conflict of interest in this research.

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