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College of Dentistry

Sabbagh Advanced Repositioning Appliance

A Project Submitted to

The College of Dentistry, University of Baghdad, Department of Orthodontics

in Partial Fulfillment for the Bachelor of Dental Surgery

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March, 2023

Certification of the Supervisor

I certify that this project entitled **Sabbagh Advanced Repositioning Appliance** was prepared by the fifth-year student **Ali Hazim Noaman** under my supervision at the College of Dentistry/University of Baghdad in partial fulfilment of the graduation requirements for the Bachelor Degree in Dentistry.

Supervisor's name

Assist. Prof, Mostafa M. Al-Khateeb

Date

March, 2023

Dedication

First and foremost, I have to thank God for giving me those countless gifts which allowed me to be presenting this graduation project.

This review of literature is wholeheartedly dedicated to my beloved family, who have been my source of inspiration and gave me the strength when I thought of giving up, who continued to provide their moral, spiritual & emotional support.

I also dedicate it to my many friends who have shown an endless support through all hard times.

And lastly to my intelligent supervisor, there are no words to describe how grateful I am, the most helpful who guided me through every step during this work and generously shared their amazing experience and knowledge with me.

Acknowledgement

This work would not have been possible without the guidance of my supervisor and constant instructions he gave me. This work is also the fruit of my relatives' support.

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List of Abbreviations

SARA	Sabbagh Advanced Repositioning Appliance
HG	headgear
3N	3 newtons
4N	4 newtons
SUS2	Sabbagh Universal Spring 2 appliance

Introduction

Orthodontic problems can be classified as skeletal problems and dental problems. Skeletal problems can be originated from skeletal deviations and treated with orthopedic corrections, fixed mechanics, or surgery. Dental problems are classified as dental class I malocclusion, dental class II malocclusion, and dental class III malocclusion. **(Alvirde et al, 2015)**

Malocclusions, which present a severe skeletal component, are difficult to solve through orthodontic treatment in patients at the end of growth and often require a combined orthodontic-surgical treatment. The mandibular propulsion appliances "no compliance" now offer new possibilities for functional orthopedic treatment in borderline cases. **(Bari, 2016)**

Mandibular retrusion is the most common characteristic in children with Class II malocclusions and shows no tendency for self-correction with growth. Furthermore, mandibular retrusion worsens during the pubertal growth spurt and maintains the same standard after this period until adulthood. **(Singh et al, 2018)**

The occlusal outcome achieved after Class II division 1 treatment with maxillary first permanent molar extractions was maintained to a large extent over a mean post-treatment follow-up of 2.5 years. Limited changes after treatment were found, for which no risk factors could be discerned. **(https://fb.watch/jCov1I9jt6/)**

The use of extraction for treatment of class II malocclusion results in loss of posterior anchorage and limited the full retraction of the anterior segment. **(Booij et al, 2020)**

There is a wide variety of complications associated with orthognathic surgery, including unusual complications that are hard to predict. **(Kim et al, 2017)**

Complications and unfavorable outcomes are part and parcel of any surgical practice and orthognathic surgery is no exception. **(Bonanthaya, 2013)**

1. SARA® is a fixed functional telescopic appliance in one universal size that can perform class II therapy can be carried out effectively and independent of patient compliance, extractions or dysgnathic surgery. (https://www.forestadentcampus365.com/course/view.php?id=103)

Aims of Review

- This review is an attempt to organize the literature regarding SARA
- It attempts to address questions that might arise in a clinical setting regarding the SARA appliance
- To point out similarities with other appliances
- To better understand the effect of SARA appliance

Chapter One: Review of Literature

1.1 Definition

SARA® is a fixed functional telescopic appliance in one universal size, with exchangeable external spring and simple mesial insertion into the HG tube. Thereby the class II therapy can be carried out effectively and independent of patient compliance, extractions or dysgnathic surgery. The interchangeable spring sleeve provides sufficient force to treat even adult patients in moderate cases. The horizontal forces cause fewer side effects, e.g. bite opening and intrusion. It is based on the principle of "progressive bite jumping". (https://www.forestadentcampus365.com/course/view.php?id=103)

The SARA® (figure 1.1.) has exchangeable outer spring (3N/ 4N). The technology, developed in collaboration with Dr. Aladin Sabbagh, is based on combining the Herbst appliance and the Jasper jumper with the objective of pooling the advantages of these two technologies. The result is a force system with an external spring which is compatible with all fixed bracket systems. It is attached to the upper jaw mesially in the headgear tube. This not only makes handling much easier, but also reduces mucous membrane irritations. **(https://grandortho.pl/resources/assets/kcfinder)**

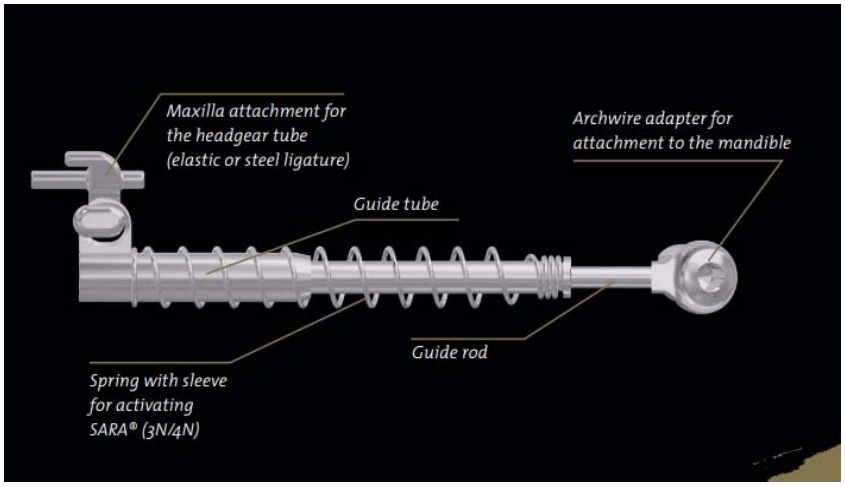

Figure 1.1. SARA® structure ***(https://grandortho.pl/resources/assets/kcfinder)***

1.2 Indications:(https://www.forestadentcampus365.com/course/view.php?id=103)

1.2.1 Mandibular Retrognathia / class II (unilateral / bilateral) (figure 1.2.)

Figure 1.2. Class II jaw relation due to mandibular retrognathism.
(**https://fb.watch/jCov1I9jt6/)**

1.2.2 Avoiding orthognathic surgery and Extractions (figure 1.3.)

Figure 1.3. SARA® appliance non-surgical correction of moderately severe class II malocclusion with bite correction (***https://fb.watch/jCov1I9jt6/***)

1.2.3 Distalization in the upper Molars (headgear effect)

1.2.4 Mesialization in the lower jaw / gap closure (with aplasia of the second permanent molars) (figure 1.4.)

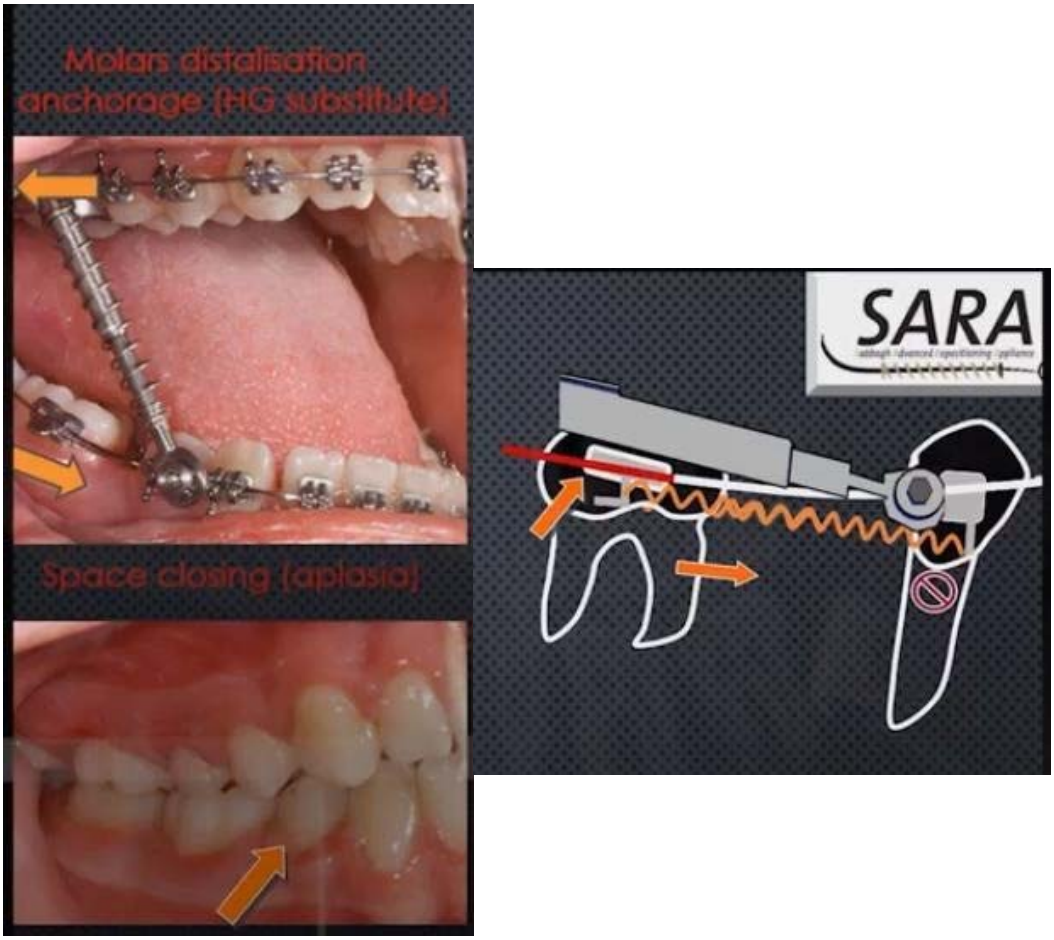

Figure 1.4. SARA® appliance in space closure on cases of aplastic lower second premolar. **(https://fb.watch/jCov1I9jt6/)**

1.2.5 TMD treatment (condyle reduction effect)(figure1.5.)(figure1.6.)

Figure 1.5. SARA® appliance in condyle reduction for management of TMD. ***(https://fb.watch/jCov1I9jt6/)***

Figure 1.6. SARA® appliance in combination with AquaSplint for TMD management. ***(https://fb.watch/jCov1I9jt6/)***

1.2.6 Sleep apnea therapy (figure 1.7.)

1.2.7 The bimaxillary retention using the "SARA® Splints"

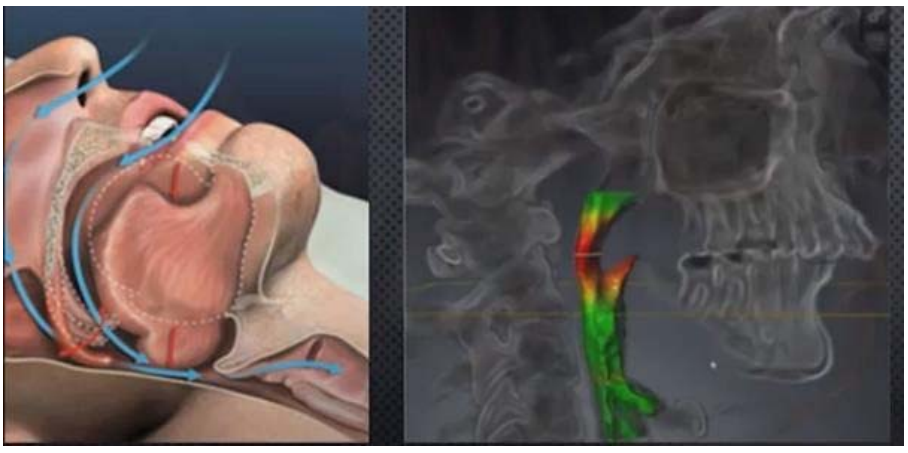

Figure 1.7. SARA® appliance in management of sleep apnea. ***(https://fb.watch/jCov1I9jt6/)***

1.2.8 Management of proclination of the lower incisors

1.3 Contraindications:

(https://grandortho.pl/resources/assets/kcfinder)

1.3.1 Severely proclined or crowding of anterior teeth in the lower jaw

1.3.2 Inadequate oral hygiene

1.3.3 Osteoarthrosis of the temporomandibular joint

1.3.4 Known allergies to any of the component materials of the device

1.3.5 Thin attached gingiva in the anterior region of the lower jaw

1.4 Treatment effects of SARA®

(https://grandortho.pl/resources/assets/kcfinder)

1.4.1 Restoration of the masticatory function

1.4.2 Stimulation of adaptive growth of the mandible (concept of progressive bite change)

1.4.3 Growth inhibition of the upper jaw

1.4.4 Dentoalveolar balance of the occlusion (elastics substitution)

1.5 The advantages of SARA®

(https://grandortho.pl/resources/assets/kcfinder)

1.5.1 Universally applicable: One version for all jaw sizes.

(Minimum inventory)

1.5.2 Easy handling: Because of the easy mesial insertion into the headgear tube

1.5.3 Cost-effectiveness: Mounting of the device possible in only a few minutes.

1.5.4 High patient acceptance: Extraction or surgery as well as the use of a headgear are not necessary.

1.5.5 Time-efficient: Time-consuming and costly laboratory processes are not necessary.

1.5.6 Compliance independent: The cooperation of the patient,

e.g. with elastics, is not required.

1.5.7 Effective: Due to the easily replaceable 3N respectively

4N spring and the 1 or 2mm spacer rings.

1.5.8 Fewer side effects: Like e.g. lateral open bite or intrusion of the upper jaw molars due to the horizontal force effect of SARA®.

1.6. Preparation for appliance (https://fb.watch/jCoEefnE3y/)

1.6.1 In the lower jaw, a steel arch wire is used at minimum dimensions of

a. 0.17x0.25 inches for a 0.18inch slot

b. 0.19x0.25 inches for a 0.22inch slot

1.6.2 Steel ligatures are used for canines and premolars even when self-ligating brackets are used (figure 1.8.)

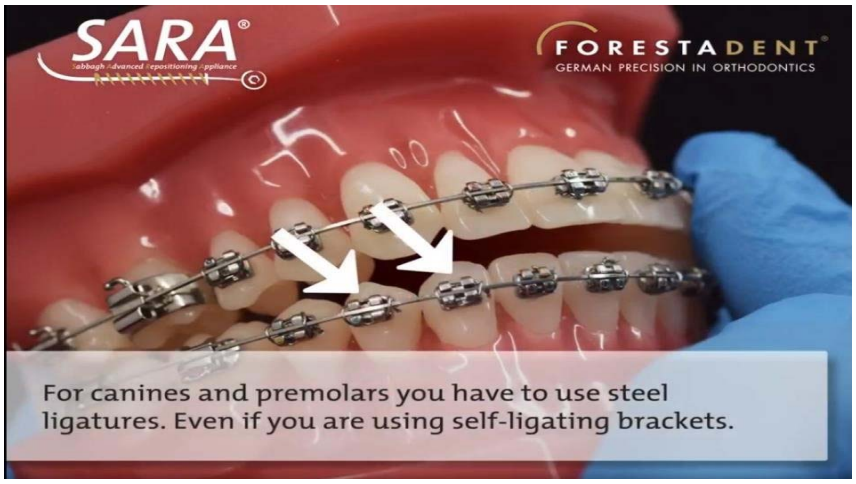

Figure 1.8. Preparation for the SARA®appliance. Steel ligatures are used for canines and premolars even when self-ligating brackets are used **(https://fb.watch/jCoEefnE3y/)**

1.6.3 To increase anchorage in lower jaw and prevent lower incisor proclination, a distal cinch-back is made as close as possible to buccal tube. (figure 1.9.)

Figure 1.9. Preparation for the SARA® appliance. distal cinch-back is made as close as possible to buccal tube (**https://fb.watch/jCoEefnE3y/)**

1.6.4 After installation of SARA® appliance, the entire mandibular arch is blocked with an elastic chain. This stabilizes the complete lower arch as one unit.

1.6.5 SARA® appliance offers a universal size, eliminating the need for any intra-oral measurements like with other appliances.

1.6.6 The horizontal force vector reduces side effects and makes adjustment of the maxillary attachment unnecessary. (figure 1.10.)

Figure 1.10. Preparation for the SARA® appliance. The horizontal force vector reduces side effects and makes adjustment of the maxillary attachment unnecessary

1.7 Installation of the appliance (https://fb.watch/jCoEefnE3y/))

1.7.1 The long rod of the maxillary attachment is inserted from the mesial side into the headgear tube. (figure 1.11.)

Figure 1.11. Installation of the SARA® appliance 1. The long rod of the maxillary attachment is inserted from the mesial side into the headgear tube. (https://fb.watch/jCoEefnE3y/))

1.7.2 An elastic or steel ligature is tightened from the hook of the buccal tube over the short mesial rod of the maxillary attachment. (figure 1.12.)

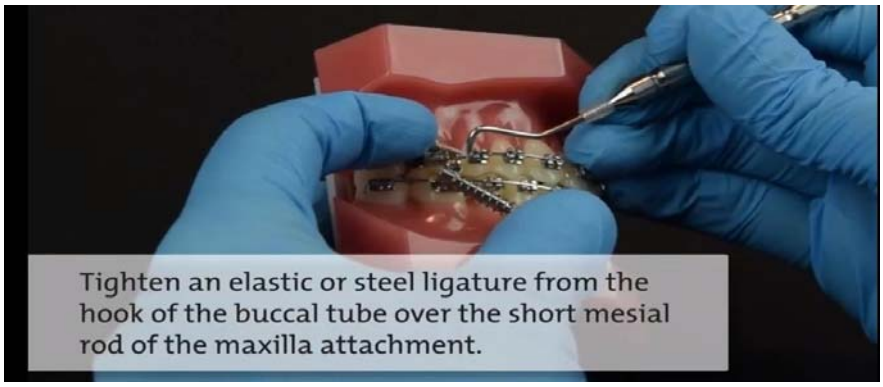

Figure 1.12. Installation of the SARA® appliance. An elastic or steel ligature is tightened from the hook of the buccal tube over the short mesial rod of the maxillary attachment. (**https://fb.watch/jCoEefnE3y/**)

1.7.3 The preassembled mandibular arch wire adapter is placed about 1mm distal to canine bracket on the steel arch wire. With the closed side being occlusal. (figure 1.13.)

Figure 1.13. Installation of the SARA® appliance. The preassembled mandibular arch wire adapter is placed about 1mm distal to canine bracket on the steel arch wire. With the closed side being occlusal (**https://fb.watch/jCoEefnE3y/**)

1.7.4 The screw is tightened with an allen key. There should be caution to deform the steel arch wire.

1.8 Activation of the appliance (https://fb.watch/jCoEefnE3y/))

1.8.1 SARA® appliance is supplied preassembled with a 3N spring.

1.8.2 It is activated automatically after proper installation.

1.8.3 Further activation can be achieved by using the 1 and 2mm spacer rings supplied with the appliance.

1.8.4 According the needs, one or more of the spacer rings can be used. These need to be crimped on the guide rod using Weingart pliers. (figure 1.14.)

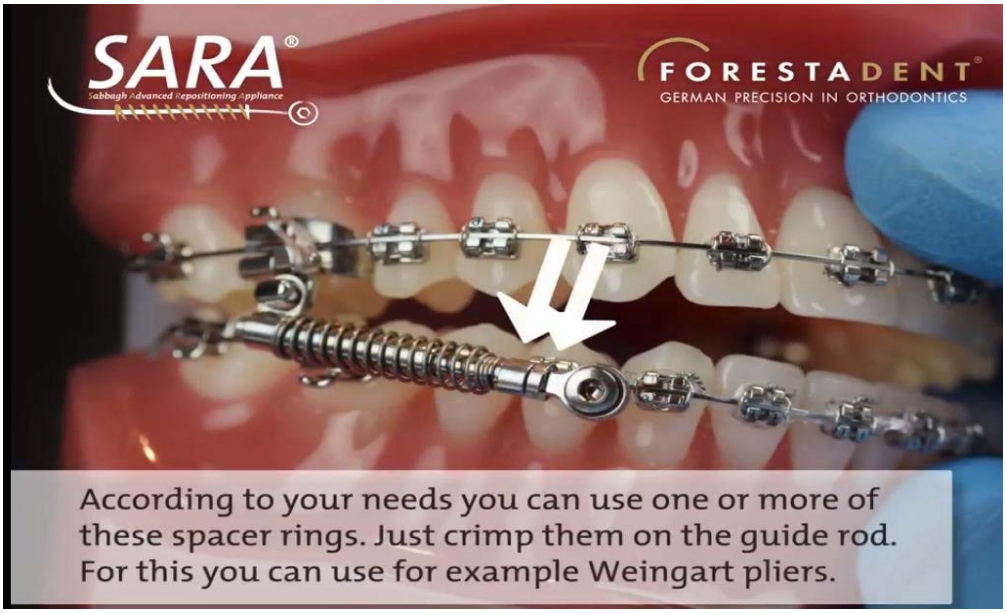

Figure 1.14. Installation of the SARA® appliance According the needs, one or more of the spacer rings can be used. (**https://fb.watch/jCoEefnE3y/)**

1.8.5 A s the need arises, the 3N spring is replaced with the 4N spring. This is done after appliance removal. (figure 1.15.)

Figure 1.15. Installation of the SARA® appliance As the need arises, the 3N spring is replaced with the 4N spring (**https://fb.watch/jCoEefnE3y/**))

1.9 Removal of the appliance (https://fb.watch/jCoEefnE3y/)

1.9.1 The screw of the mandibular arch wire adapter is opened.

1.9.2 The guide rod and spring are removed by simply pulling them apart. (figure 1.16.)

Figure 1.16. Removal of the SARA® appliance The guide rod and spring are removed by simply pulling them apart. (**https://fb.watch/jCoEefnE3y/**))

1.9.3 The ligature securing the maxillary attachment to the hook of the buccal tube is removed. (figure 1.17.)

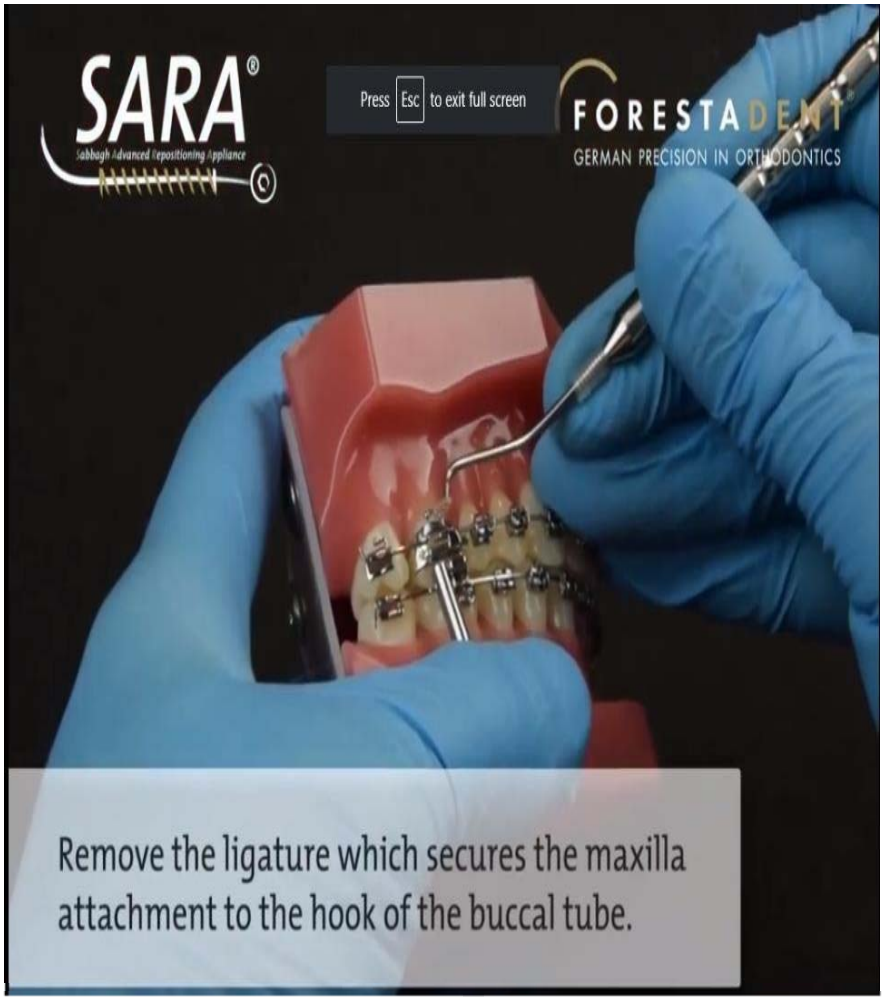

Figure 1.17. Removal of the SARA® appliance The ligature securing the maxillary attachment to the hook of the buccal tube is removed (**https://fb.watch/jCoEefnE3y**/))

1.9.4 The maxillary attachment is then removed together with the guide tube.

Table 1.1. tips and tricks (https://grandortho.pl/resources/assets/kcfinder)

problem definition	possible causes	solution
patient cannot close mouth completely, SARA seems to be too long	extraction	attach mandibular archwire adapter between mandibular lateral incisor canine instead of between mandibular canine and first premolar
	premolar agenesis	place a band with headgear buccal tube on maxillary second molar and insert SARA maxilla attachment here
	verythin premolar	
maxilla and mandible segments of SARA at maximum oral aperture	above average oral aperture of patient	explain the re-insertion to the patient
	condyle hypermobility	physiotherapy/ rotational exercise
mandibular incisors are strongly proclined	insufficient anchorage	use strong rectangular stainless steel archwire (preferably slot-filling) with distal cinch back as close to buccal tube as possible
	too fast activation	use lingual crown torque or insert McLaughlin Bennet 5.0 bracket
		insert elastic chain (power chain) from 6-6
		temporary anchorage with mini implants/ TADs
fastening screw on mandibular connection loosens	fixing screw is not tightened sufficiently	retighten the fixing screw
		secure with screw-locking adhesive (eg. Ceka bond)

Article No.		Description	Force	Amount
324-0200		**SARA® comprising:** 2x 3N Spring with sleeve (324-0003) 2x Archwire adapter for attachment to the mandible 2x Maxilla attachment for the headgear tube (1x left and 1x right) 2x Guide rod 2x Guide tube 2x Spacer ring, 1 mm (324-0001) 2x Spacer ring, 2 mm (324-0002) 1x Hexagon key (320-0109)	3N	1

Figure 1.18. Order Details (https://grandortho.pl/resources/assets/kcfinder)

Article No.		Description	Amount
324-0001		**Spacer ring,** 1 mm	1
324-0002		**Spacer ring,** 2 mm	1
324-0003		**3N Spring** with sleeve (10 mm activation)	1
324-0004		**4N Spring** with sleeve (10 mm activation)	1
324-0210		**Mounting Kit** comprising: 2x Archwire adapter for attachment to the mandible 2x Maxilla attachment for the headgear tube (1x left and 1x right)	1
324-0005		**Class II Hexagon key**	1

Figure 1.19. Spare Parts (https://grandortho.pl/resources/assets/kcfinder)

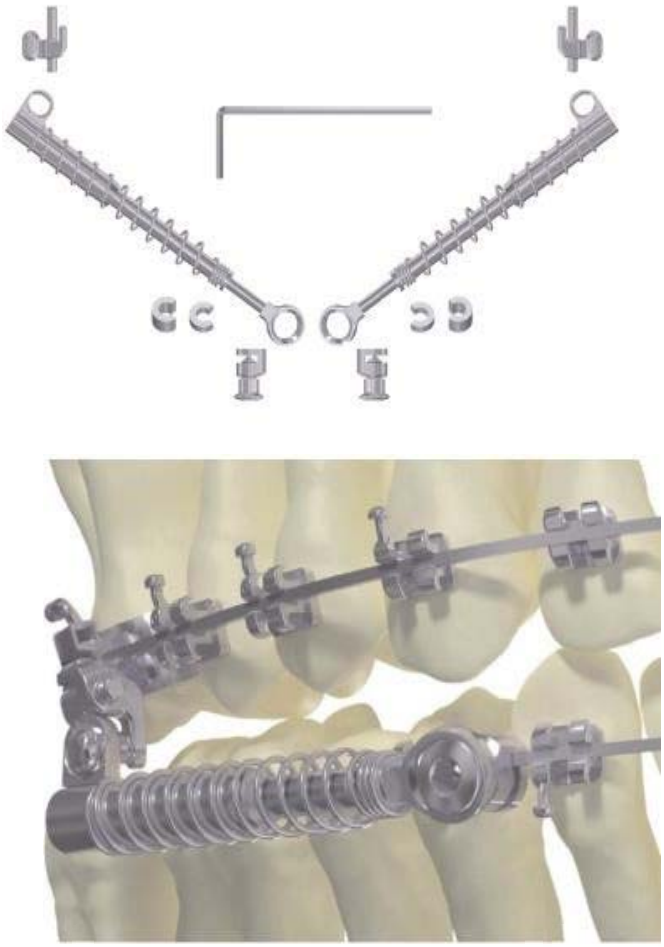

Figure 1.20. SARA® Sabbagh Advanced Repositioning Appliance, Kit ***(fhttps://www.orthodepot.de/ORTHO--OrthoDepot-/Class-2---3/sara-forestadent/product-6189.html?language=en)***

Order No.		Stück content	Beschreibung description
950-0127		1	**SARA® Modell** **SARA® Model**

Figure 1.21. SARA®Model (**https://www.forestadent.com/catalog_36_de-en/#146)**

1.10 Other similar appliances

1.10.1 Sabbagh Universal Spring 2 appliance

The SUS is a combination between the Herbst appliance (as a telescope) and the Jasper Jumper (as a spring) aiming to increase the efficacy of the treatment and to minimize their disadvantages. (Sabagh SUS2 appliance pdf) (figure 1.22.)

Figure 1.22. Sabbagh universal spring
(http://www.moroortodontia.com.br/leitura/sabagh)

The SUS2 showed therapeutic efficacy for both Class II div 1 and 2 patients although it more commonly caused dentoalveolar rather than skeletal changes with better long-term growth pattern of div 2 patients and its conformity with camouflage treatments (mild or moderate Class II). (**Hemmatpour S. et al, 2021**)

SUS 2 corrected class II/1 malocclusion of patients in the postpubertal growth period by inhibiting the maxilla's forward growth, advancing the mandible, decreasing the nasolabial and interincisal angles, proclining the incisors, increasing the facial height, and clockwise rotation of the occlusal plane. Extraction reduced the interincisal angle and protruded the lower incisors. However, it did not change the soft tissue thickness and did not cause a clockwise rotation in the occlusal plane. (**Hemmatpour S. et al, 2016**)

The correction of class ii malocclusion by sus² appliance in late adolescence was achieved by only dentoalveolar changes. Thus, it can be an acceptable substitute to class ii elastics for noncompliant patients. (Uyanlar et al., 2014) Treatment of the adult patient is based on the understanding that management of Class II malocclusion using the non-extraction protocol does not depend on restriction of maxillary growth or modification of mandibular growth; rather, it is mostly dentoalveolar. (**Pocket Dentistry DrZezo, 2016**) (figure 1.23.) (figure 1.24.)

*Figure 1.23. Pretreatment facial (A-C) and intraoral (D-H) photographs show a Class II malocclusion with deep curve of Spee and blocked right canine. I and J, Second molar extrusion. (**Pocket Dentistry DrZezo, 2016**)*

Figure 1.24. Final facial (K-M) and intraoral (N-R) photographs. (**Pocket Dentistry DrZezo, 2016**)

1.10.2 The Herbst appliance

The Herbst appliance is most suitable for the treatment of Class II malocclusion in patients with retrognathic mandibles and retroclined maxillary incisors. Herbst treatment can also be performed during the post-pubertal period in young adults as an alternative to orthognathic surgery due to the favorable results in the intermaxillary jaw base relationships and skeletal profile convexity, the lower cost and risk for the patient. (**Orthodontic Treatment of the Class II Noncompliant Patient. 2006**)

1.10.3 **Jasper Jumper**

Treatment with the Jasper Jumper associated with fixed appliances showed a mild, but significant clockwise rotation of the mandible and an increase in LAFH, denoting a vertical influence of this protocol on facial structures. The maxillary molars had significantly greater distalization with the Jasper Jumper. Previous studies also observed retrusion of the maxillary incisors in patients treated with the

Jasper Jumper, while other researches indicated extrusion of the maxillary incisors using Jasper Jumper. For mandibular incisors, the effects are protrusion of these teeth using the Jasper Jumper as well as its intrusion. Most of the studies which also reported mesialization and extrusion of the mandibular molars with the use of Jasper Jumper appliance. (**Orthodontic Treatment of the Class II Noncompliant Patient. 2006**) (figure 1.25.)

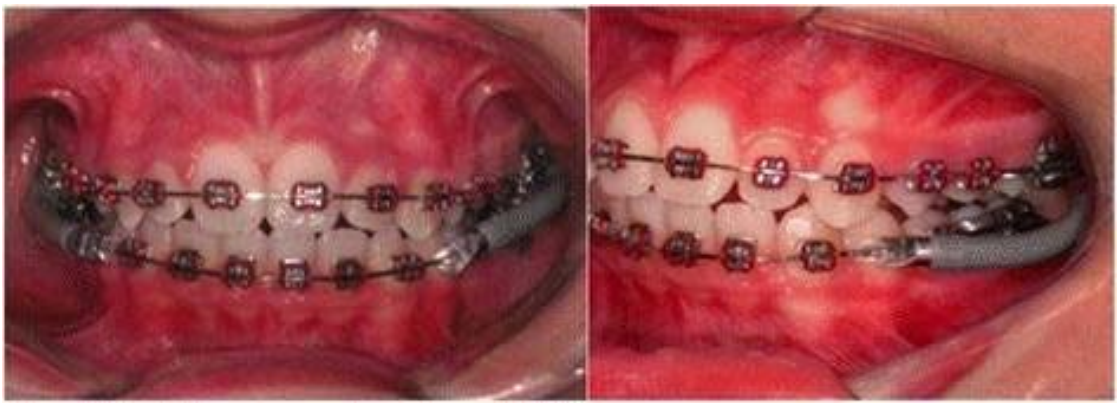

*Figure 1.25. Jasper Jumper appliance (**Orthodontic Treatment of the Class II Noncompliant Patient. 2006**)*

Chapter Two:

Discussion

Chapter Two: Discussion

SARA can restore masticatory function by treatment of underlying malocclusion. It can eliminate the problem of patient's compliance limiting results of orthodontic treatment. SARA can be used in multiple occasions such as correction of class II skeletal malocclusion, class III skeletal malocclusion, TMD, and sleep apnea. Nevertheless, it is still fixed orthodontic appliance that needs meticulous hygiene for application and should be used in severe skeletal malocclusion cases or cases of osteoarthrosis of TMJ.

Chapter Three: Conclusion and Suggestions

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Conclusions

- SARA® is a fixed functional telescopic appliance in one universal size
- class II therapy can be carried out effectively and independent of patient compliance, extractions or dysgnathic surgery
- SARA® is based on combining the Herbst appliance and the Jasper jumper with the objective of pooling the advantages of these two technologies
- The Sabbagh Universal Spring Appliance 2 showed therapeutic efficacy for both Class II div 1 and 2 patients although it more commonly caused dentoalveolar rather than skeletal changes

Suggestions

- Conducting clinical trials on SARA appliance
- Doing comparative studies between SARA and other functional appliances
- Doing a questionnaire for the orthodontists about using SARA appliance

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