Appendix A. Summary of data extracted from the articles

Author (A) Publication year (YP) Study Type (TS)	Inclusion criteria (IN) Exclusion criteria (EX)	Therapy (T) Sample size (S) Mean age (MA) N° of dropouts (D)	Clinical outcomes	Force magnitude (FM) Force direction (FD) Time of wearing (TW) Mean Therapy Time (TD) Follow-up (FP)	2D or 3D radiographic exams
A: de Souza RA, Rino Neto J, de Paiva JB YP: 2019 TS: prospective non-randomized clinical trial	**IN**: Angle class III malocclusion due to the deficiency of the middle third of the face Pre-pubertal growth spurt not yet occurred (evaluated through carpal radiography) Straight or concave profile, Wits appraisal smaller or equal to 2mm Presence of interradicular spaces for insertion of mini-implants **EX**: Patients with systemic problems or syndromes Patients with pseudo-class III or muscle dysfunctions Patients previously submitted to orthodontic treatment	Case group 1: **T**: RME + Petit facemask + elastics **S**: 12 (6M; 6F) **MA**: 10.0 years **D**: 0 Case group 2: **T**: 2 mini-implants inserted close to the upper first molar roots and 2 mini-implants inserted in the lower canine region + elastics (length of mini-implants: 8-10mm, 1.5mm thick with transmucosal section of 2mm) **S**: 12 (4M; 8F) **MA**: 10.0years **D**: 0	SNA (°) SNB (°) ANB (°) Wits (mm) Overjet (mm) Overbite (mm) SNMP (°) IMPA (°) U1PP (°)	Case group 1: **FM**: 400g per side **FD**: inclination of 15°-20° with the occlusal plane **TW**: 14 to 16h per day, changing elastics every day **TD**: 16.0 months Case group 2: **FM**: 1° month: 100g per side; 2° month: 200g per side until the end of therapy **FD**: inclination of 45° in relation to the occlusal plane **TW**: 24h per day **TD**: 12.5 months	Lateral cephalogram pre-treatment (T1) and post-treatment (T2)
A: Lee HJ, Choi DS, Jang I, Cha BK YP: 2021 TS: retrospective study	**IN**: Patients who received treatment with RME + facemask or miniplates as anchorage Anterior crossbite or edge-to-edge incisor relationship Class III molar relationship and Wits appraisal of -2.5mm or less **EX**: Prior orthopedic or orthodontic treatment Craniofacial deformities Poor compliance	Case group 1: **T**: RME + facemask + elastics **S**: 23 (8M; 15F) **MA**: 10.0 ± 1.5 years **D**: 0 Case group 2: **T**: facemask + miniplates as anchorage for maxillary protraction + elastics **S**: 20 (6M; 14F) **MA**: 10.6 ± 1.1 years **D**: 0	SNA (°) SNB (°) ANB (°) Wits (mm) Overjet (mm) Overbite (mm) SNMP (°) IMPA (°) U1PP (°)	Case group 1: **FM**: 300-400g per side **TW**: at least 14h per day **TD**: 9.0 ± 0.3 months **FP**: 3 years Case group 2: **FM**: 300-400g per side **TW**: at least 14h per day **TD**: 9.7 ± 0.3 months **FP**: 3 years	Lateral cephalogram pre-treatment (T1) and post-treatment (T2)
A: Willmann JH, Nienkemper M, Tarraf NE, Wilmes B, Drescher D YP: 2018 TS: retrospective study	**IN**: Moderate to severe class III, Wits less or equal to -2mm Age 7-12years Lateral cephalograms before and after treatment Anterior crossbite or incisor edge to edge relationship Class III molar relationship **EX**: Craniofacial anomalies or systemic diseases Forced or functional bite	Case group 1: **T**: Hybrid-Hyrax device fitted on 2 paramedian miniimplants in the anterior palate + facemask + elastics **S**: 17 (8M; 9F) **MA**: 8.74 ± 1.20 years **D**: 0 Case group 2: **T**: Hybrid-Hyrax device fitted on 2 paramedian miniimplants in the anterior palate + mentoplate + elastics **S**: 17 (7M; 10F) **MA**: 9.43 ± 0.95 years **D**: 0	SNA (°) SNB (°) ANB (°) Wits (mm) Overjet (mm) Overbite (mm) SNMP (°) IMPA (°) U1PP (°)	Case group 1: **FM**: 400g on each side **FD**: inclination of 20-30° relative to the occlusal plane **TW**: 14-16hours per day **TD**: 0.79 ± 0.26 years Case group 2: **FM**: 200g on each side **FD**: inclination of 10°-15° relative to the occlusal plane **TW**: 24hours per day **TD**: 0.87 ± 0.25 years	Lateral cephalogram pre-treatment (T1) and post-treatment (T2)
Author (A) Publication year (YP) Study Type (TS)	Inclusion criteria (IN) Exclusion criteria (EX)	Therapy (T) Sample size (S) Mean age (MA) N° of dropouts (D)	Clinical outcomes	Force magnitude (FM) Force direction (FD) Time of wearing (TW) Mean Therapy Time (TD) Follow-up (FP)	2D or 3D radiographic exams
A: Seiryu M, Ida H, Mayama A, Sasaki S, Sasaki S, Deguchi T, Takano-Yamamoto T YP: 2020 TS: single-center prospective randomized controlled trial	**IN**: Skeletal class III (ANB less or equal to 2.5°) Overjet equal or greater than 0 Patients undergoing circumpubertal phase of skeletal development (cervical vertebral maturation stage CVMS II-IV) **EX**: Congenital or systemic diseases Skeletal asymmetry Temporomandibular joint disorder	Case group 1: **T**: palatal arch with hooks + facemask + elastics **S**: 20 (12M; 8F) **MA**: 10years 5 months ± 1year 8 months **D**: 0 Case group 2: **T**: miniscrew (length 8-10mm, diameter 1.4mm) inserted in the anterior region of the palate + palatal arch attached to the miniscrew + facemask + elastics **S**: 19 (12M; 7F) **MA**: 11years 1 month ± 1year 3 months **D**: 0	SNA (°) SNB (°) ANB (°) Wits (mm) Overjet (mm) Overbite (mm) SNMP (°) IMPA (°) U1PP (°)	Case group 1: **FM**: 250g per side **FD**: angle <30° from the occlusal plane **TW**: 12 hours per day **TD**: 1 year 9 months ± 10.2 months Case group 2: **FM**: 250g per side **FD**: angle <30° from the occlusal plane **TW**: 12 hours per day **TD**: 1 year 9 months ± 9.9 months	Lateral cephalogram pre-treatment (T1) and post-treatment (T2) CBCT after mini-screw implantation
A: Bozkaya E, Yüksel AS, Bozkaya S YP: 2017 TS: controlled clinical trial	**IN**: Skeletal and dental class III malocclusion (ANB < 0°, Wits < -2mm) Maxillary retrusion (SNA < 82°) or maxillary retrusion and mandibular protrusion (SNB > 80°) Decreased or optimum mandibular plane angle (SN/GoGn < 38°) Absence of functional shift of the mandible between developmental growth stages PP2 and MP3cap evaluated using hand-wrist radiograph **EX**: Craniofacial anomalies Previous orthodontic treatment	Control group: **T**: untreated (due to poor hygiene or changes in dentition) **S**: 18 (9M; 9F) **MA**: 10.6 ± 1.12years **D**: 0 Case group: **T**: Petit-type facemask therapy anchored from the zygomatic buttresses of the maxilla by using two L-shaped miniplates, fixed using to self-drilling miniscrews (2mm in diameter and 5mm in length) **S**: 18 (8M; 10F) **MA**: 11.4 ± 1.28 years **D**: 0	SNA (°) SNB (°) ANB (°) Wits (mm) Overjet (mm) Overbite (mm) SNMP (°) IMPA (°) U1PP (°)	Control group **FM**: - **FD**: - **TW**: - **TD**: observation period of 0.82 ± 0.28 years Case group: **FM**: 400g per side **FD**: 30° downwards from the occlusal plane **TW**: all day except during meals **TD**: 1.08 ± 0.35 years	Control group: Lateral cephalograms acquired before (T0) and after (T1) the observation period Case group: Lateral cephalograms acquired before miniplate insertion (T0) and after facemask therapy (T1)
Author (A) Publication year (YP) Study Type (TS)	Inclusion criteria (IN) Exclusion criteria (EX)	Therapy (T) Sample size (S) Mean age (MA) N° of dropouts (D)	Clinical outcomes	Force magnitude (FM) Force direction (FD) Time of wearing (TW) Mean Therapy Time (TD) Follow-up (FP)	2D or 3D radiographic exams
A: Ngan P, Wilmes B, Drescher D, Martin C, Weaver B, Gunel E YP: 2015 TS: retrospective study	**IN**: Class III malocclusion at the time of initial observation as defined by one or more of the following characteristics: Anterior crossbite or edge-to-edge incisal relationship Accentuated mesial step or class III permanent molar relationship Wits appraisal smaller than -3mm or an ANB smaller than -2° **EX**: Craniofacial syndromes Prior orthodontic or orthopedic treatment	Control group: **T**: untreated **S**: 20 Case group 1: **T**: tooth-borne maxillary RPE with bands fixed on maxillary primary second molars and permanent first molars + hooks in the canine area + elastics with protraction device **S**: 20 (8M; 12F) **MA**: 9.8 ± 1.6 years **D**: 0 Case group 2: **T**: bone-anchored Hybrid-Hyrax maxillary RPE with two mini-implants (2x9mm) placed in the anterior palate + elastics + protraction appliance **S**: 20 (8M;12F) **MA**: 9.6 ± 1.2 years **D**: 0	SNA (°) SNB (°) ANB (°) Wits (mm) Overjet (mm) Overbite (mm) SNMP (°) IMPA (°) U1PP (°)	Case group 1: **FM**: 300-600g per side depending on the age of the patient **FD**: 30° downwards and forward with respect to the occlusal plane **TW**: 12-14hours a day Case group 2: **FM**: 300-600g per side depending on the age of the patient **FD**: 30° downwards and forward with respect to the occlusal plane **TW**: 12-14hours a day	Lateral cephalogram pre-treatment (T1) and post-treatment (T2)
A: Nienkemper M, Wilmes B, Pauls A, Drescher D YP: 2013 TS: non-randomized clinical trial	**IN**: Mild to severe skeletal class III malocclusion (Wits appraisal less or equal to 2.0mm) Age of up to 12years	**T**: RME with hybrid-hyrax and maxillary protraction with facemask; insertion of 2 mini-implants in the anterior palate on both sides of the midpalatal suture. **S**: 16 (10M; 6 F) **MA**: 9.5 ± 1.3 years **D**: 0	SNA (°) SNB (°) ANB (°) Wits (mm) Overjet (mm) Overbite (mm) SNMP (°) IMPA (°) U1PP (°)	**FM**: 400g on each side **FD**: 20°-30° forwards and downwards direction with respect to the occlusal plane **TW**: not reported **TD**: 5.8 ± 1.7 months	Lateral cephalogram pre-treatment (T1) and post-treatment (T2)
A: Ge YS, Liu J, Chen L, Han JL, Guo X YP: 2012 TS: randomized clinical trial	**IN**: Prepubertal stage of skeletal maturity according to the cervical vertebral maturation method (CS1-CS3) Skeletal and dental class III malocclusion with: Maxillary deficiency (ANB < -0°; Wits appraisal < -2mm) Reverse incisal relationship Positive overbite No significant skeletal asymmetry **EX**: Systematic diseases Congenital deformities	Case group 1: **T**: Hyrax RME + Petit facemask therapy (RME/FM) **S**: 24 (12M; 12F) **MA**: 10 years 6 months **D**: 1 (M) Case group 2: **T**: Petit facemask in association with miniscrew implants (MSI/FM); the implant site was the zygomatic buttress of the maxilla. The miniscrews were 2mm in diameter and 14mm in length. **S**: 25 (11M; 14F) **MA**: 10 years 4 months **D**: 5 (2M; 3F)	SNA (°) SNB (°) ANB (°) Wits (mm) Overjet (mm) Overbite (mm) SNMP (°) IMPA (°) U1PP (°)	Case group 1: **FM**: 400-500g per side **FD**: downward and forward vector **TW**: **TD**: 1 year 1 month Case group 2: **FM**: 200-250g on each side **FD**: 30° angle downward to the occlusal plane **TW**: at least 14hours per day **TD**: 11 months	Lateral cephalogram pre-treatment (T1) and post-treatment (T2)
Author (A) Publication year (YP) Study Type (TS)	Inclusion criteria (IN) Exclusion criteria (EX)	Therapy (T) Sample size (S) Mean age (MA) N° of dropouts (D)	Clinical outcomes	Force magnitude (FM) Force direction (FD) Time of wearing (TW) Mean Therapy Time (TD) Follow-up (FP)	2D or 3D radiographic exams
A: Nienkemper M, Wilmes B, Franchi L, Drescher D YP: 2015 TS: controlled clinical study	**IN**: Patients of white ancestry Dentoskeletal class III malocclusion characterized by: Wits appraisal of -2mm or less Anterior crossbite or edge-to-edge relationship Class III molar relationship Prepubertal stage of skeletal maturity (CS1-CS3)	Control group: **T**: untreated **S**: 16 (8M; 8F) **MA**: 9.4 6 1.1 years **D**:0 Case group: **T**: Rapid palatal expansion with hybrid hyrax (bone and tooth-borne device); two 2x9mm miniimplants were inserted in the anterior palate on both sides of the midpalatal suture **S**: 16 (10M; 6F) **MA**: 9.5 ± 1.6 years **D**: 0	SNA (°) SNB (°) ANB (°) Wits (mm) Overjet (mm) Overbite (mm) SNMP (°) IMPA (°) U1PP (°)	Case group: **FM**: 400g on each side **FD**: downward and forward vector of 20°-30° to the occlusal plane **TW**: 16 hours per day **TD**: 5.8 ± 1.6 months	Lateral cephalogram pre-treatment (T1) and post-treatment (T2)
A: Papadopoulou AK, Koletsi D, Masucci C, Giuntini V, Franchi L, Darendeliler MA YP: 2022 TS: retrospective long-term study	**IN**: Skeletal class III malocclusion due to retrognathic maxilla Concave facial profile with underdeveloped midface characteristics Presence of anterior crossbite Permanent dentition with molar class III relationship (for case group 2 only) **EX**: Previous orthodontic or orthopaedic treatments Congenital anomalies	Case group 1: **T**: RME + facemask **S**: 16 (5M; 11F) **MA**: 6.5 ± 0.9 years **D**: 0 Case group 2: **T**: late alt-RAMEC + HybridHyrax + lingual arch + miniscrew supported intraoral elastics. The HH device was fixed through 2x9mm palatal miniscrews, bilaterally to the midpalatal suture. The lingual arch was cemented with bands. Two mandibular miniscrews were inserted between the canines and lateral incisors. **S**: 15 (7M; 8F) **MA**: 12.52 ± 0.94 years **D**: 0	SNA (°) SNB (°) ANB (°) Wits (mm) Overjet (mm) Overbite (mm) SNMP (°) IMPA (°) U1PP (°)	Case group 1: **FM**: 400-500g per side **FD**: downward and forward direction of 30° to the occlusal plane **TW**: at least 14 hours per day **TD**:1.6 ± 0.5years **FP**: 9.2 ± 2.3 years Case group 2: **FM**: 400g per side **FD**: from the hybrid-hyrax ball hooks to the lingual arch S hooks **TW**: full-day **TD**: 0.5 years **FP**: 4.2 ± 0.2 years	Lateral cephalogram pre-treatment (T1) and post-treatment (T2)
A: Kaya D, Kocadereli I, Kan B, Tasar F YP: 2011 TS: pilot study	**IN**: Concave profile Skeletal and dental class III malocclusion Edge-to-edge or reverse incisor relationship Symptom-free temporo-mandibula joint function **EX**: Previous orthodontic or orthopaedic treatment Systemic diseases or congenital deforimities	**T**: Alt-RAMEC protocol followed by maxillary protraction with Delaire-type facemask and titanium miniplates inserted on the lateral nasal wall of the maxilla. **S**: 15 (6M; 9F) **MA**: 11.6 ± 1.59 years **D**: 0	SNA (°) SNB (°) ANB (°) Wits (mm) Overjet (mm) Overbite (mm) SNMP (°) IMPA (°) U1PP (°)	**FM**: 350-400g per side **FD**: 30° downwards and forwards to the occlusal plane **TW**: full-time **TD**: 9.9 ± 2.63 months	Lateral cephalogram pre-treatment (T1) and post-treatment (T2)
Author (A) Publication year (YP) Study Type (TS)	Inclusion criteria (IN) Exclusion criteria (EX)	Therapy (T) Sample size (S) Mean age (MA) N° of dropouts (D)	Clinical outcomes	Force magnitude (FM) Force direction (FD) Time of wearing (TW) Mean Therapy Time (TD) Follow-up (FP)	2D or 3D radiographic exams
A: De Clerck HJ, Cornelis MA, Cevidanes LH, Heymann GC, Tulloch CJ YP: 2009 TS: non-randomized clinical trial	**IN**: Presence of moderate-to-severe maxillary deficiency Minimum age of 10years and maximum age of 13years Late mixed dentition or permanent dentition Secondary alveolar bone graft performed at least 6 months before the study onset **EX**: Presence of associated syndromes Poor oral hygiene	**T**: intermaxillary traction between miniplates placed in the maxilla (infrazygomatic crests) and in the mandible (between canine and first premolar), in combination with a bite plane to jump the crossbite **S**: 3 (F) **MA**: aged 10 to 11 years **D**: 0	SNA (°) SNB (°) ANB (°) Wits (mm) Overjet (mm) Overbite (mm) SNMP (°) IMPA (°) U1PP (°)	**FM**: 100g per side, increased to 200g per side after 2 months **FD**: from the upper miniplates to the lower miniplates **TW**: 24 hours per day **TD**: 12 to 16 months **FP**: 11 to 38 months	Lateral cephalogram pre-treatment (T1) and post-treatment (T2)
A: Buyukcavus MH, Kale B, Aydemir B YP: 2020 TS: non-randomized clinical trial	**IN**: Negative overjet Concave profile Maxillary deficiency Decreased SNA angle and negative ANB angle **EX**: Presence of craniofacial anomalies or systemic disorders	Case group 1: **T**: RME + facemask **S**: 18 (8M:10F) **MA**: 10.58 ± 1.03 years **D**: 0 Case group 2: **T**: ALT-Ramec + facemask **S**: 19 (9M/10F) **MA**: 11.66 ± 1.23 **D**: 0 Case group 3: **T**: bilateral titanium miniplates inserted in the apertura piriformis region **S**: 18 (9M; 9F) **MA**: 11.96 ± 0.92 **D**: 0	SNA (°) SNB (°) ANB (°) Wits (mm) Overjet (mm) Overbite (mm) SNMP (°) IMPA (°) U1PP (°)	Case group 1: **FM**: 400-500g on each side **FD**: **TD**: 0.94 ± 0.42 years Case group 2: **FM**: 500g on each side **FD**: **TD**: 0.52 ± 0.16 years Case group 3: **FM**: **FD**: **TD**: 0.7 ± 0.21 years	Lateral cephalogram pre-treatment (T1) and post-treatment (T2)
A: Ağlarcı, Cahide et al. YP: 2015 TS: randomized clinical trial	**IN**: Skeletal class III malocclusion characterized by maxillary deficiency and/or mandibular protrusion (ANB°<0 or Wits<1) Restrusive nasomaxillary complex, anterior crossbite and concave profile Positive overbite Pubertal period evaluated by hand-wrist radiographs Vertically normal growth pattern EX: Cleft lip palate, craniofacial anomalies or syndromes Previous orthodontic treatment	Case group 1: **T:** facemask **S:** 25 (13F; 12M) **MA:** 11.21±1.32 years **D:** 0 Case group 2: **T:** skeletal anchorage with intermaxillary elastics (BAMP) **S:** 25 (13F; 12M) **MA:** 11.75±1.23 years **D:** 0	SNA (°) SNB (°) ANB (°) Wits (mm) Overjet (mm) Overbite (mm) SNMP (°) IMPA (°) U1PP (°)	Case group 1: **FM:** 400g per side **FD:** 20°-30° downwards from the occlusal plane **TD:** 0.52±0.09 years Case group 2: **FM:** 200g per side **FD:** not reported **TD:** 0.76±0.09 years	Lateral cephalogram pre-treatment (T1) and post-treatment (T2)
Author (A) Publication year (YP) Study Type (TS)	Inclusion criteria (IN) Exclusion criteria (EX)	Therapy (T) Sample size (S) Mean age (MA) N° of dropouts (D)	Clinical outcomes	Force magnitude (FM) Force direction (FD) Time of wearing (TW) Mean Therapy Time (TD) Follow-up (FP)	2D or 3D radiographic exams
A: Koh, Chung YP: 2014 TS: randomized clinical trial	**IN**: Overjet > -2mm Cervical vertebra maturation stage of 3-4 EX: Previous orthodontic treatment or surgery Craniofacial deformities	Case group 1: **T:** toothborne hyrax expander + facemask **S:** 28 (7M; 21F) **MA:** 10.09 years **D:** 0 Case group 2: **T:** skeletal anchored facemask thorugh miniplates **S:** 19 (8M; 11 F) **MA:** 11.21 years **D:** 0	SNA (°) SNB (°) ANB (°) Wits (mm) Overjet (mm) Overbite (mm) SNMP (°) IMPA (°) U1PP (°)	Case group 1: **FM:** 400g per side **FD:** 20°-30° downwards from the occlusal plane **TD:** not reported Case group 2: **FM:** 400g per side **FD:** 20°-30° downwards from the occlusal plane **TD:** not reported	Lateral cephalogram pre-treatment (T1) and post-treatment (T2)
A: Sar, Arman, Uckan, Yazici YP: 2009 TS: randomized clinical trial	**IN:** Skeletal maturation between PP2 and MP3cap Skeletal and dental class III malocclusion with maxillary deficiency (ANB°<0; Wits<-2mm) Vertically normal growth pattern Normal or increased overbite Retrusive nasomaxillary complex	Case group 1: **T:** RME + facemask **S:** 15 (8M; 7F) **MA:** 10.31 years Case group 2: **T:** 2 mini-plates placed laterally to the apertura piriformis + facemask **S:** 15 (10M; 5F) **MA:** 10.91 years	SNA (°) SNB (°) ANB (°) Wits (mm) Overjet (mm) Overbite (mm) SNMP (°) IMPA (°) U1PP (°)	Case group 1: **FM:** 400g **FD:** 20-30° downwards **TD:** 9.45 months Case group 2: **FM:** 400g **FD:** 20-30° downwards **TD:** 6.78 months	Lateral cephalogram pre-treatment (T1) and post-treatment (T2)
A: Tripathi, Rai, Singh, Kalra YP: 2016 TS: non-randomized clinical trial	**IN**: Skeletal class III with maxillary deficiency Edge to edge bite or reverse incisor relationship Normal or increased overbite **EX**: Systemic diseases or congenital deformities	Case group 1: **T:** facemask maxillary protraction **S:** 10 (5F; 5M) **MA:** 9.90 years Case group 2: **T:** skeletal anchored maxillary protraction **S:** 10 (5F; 5M) **MA:** 10.10 years	SNA (°) SNB (°) ANB (°) Wits (mm) Overjet (mm) Overbite (mm) SNMP (°) IMPA (°) U1PP (°)	Case group 1: **FM:** 400g per side **FD:** 20-30° downwards **TD:** 10.00 months Case group 2: **FM:** 400g per side **FD:** 20-30° downwards **TD:** 5.8 months	Lateral cephalogram pre-treatment (T1) and post-treatment (T2)