Staged autogenous calvarial bone grafting and dental implants placement in the management of oligodontia: a retrospective study of 20 patients over a 12-year period

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Abstract. Oligodontia demands multidisciplinary management due to its repercussions on dentofacial growth. To place implants to realize implant-borne fixed denture, preimplant surgery may be necessary if bone volumes are insufficient. Our aim was to assess bone increase following autogenic bone grafting and to discuss prosthetic options. Twenty patients followed for oligodontia, who underwent bone grafting, were treated from 2008 to 2019. Transversal and vertical bone levels were measured pre- and postoperatively to assess alveolar ridge augmentation. Mean horizontal grafting increase was 4.60 mm [standard deviation (SD) 0.79 mm], mean sinus lift increase was 9.95 mm (SD 2.35 mm). Mean implants placed per patient was 9, mean implants placed on grafted site was 5 per patient. Overall implant survival rate was 100%. All patients benefited from prosthetic procedures when it was planned to perform implant-borne fixed dentures. Within the framework of a complete treatment plan (involving paediatric dentistry, dentofacial orthopaedics, oral and maxillofacial surgery, and prosthodontics), autologous bone grafting combined or not with orthognathic surgery is fully adapted to patients with oligodontia. It allows reconstruction of favourable bone volumes for placement of implants to realize implant-borne fixed dentures, with high implant survival rates and great improvements to quality of life.

Oligodontia is a rare developmental dental anomaly defined by the absence of six or more definitive teeth, excluding third molars[1]. This inherited genetic pathology has aesthetic and functional consequences – alteration of phonation/mastication/deglutition – associated with a significant repercussion on quality of life[2,3]. In addition, morphological abnormalities (such as a peg-shaped lateral incisors), structural abnormalities (odontodysplasia), rash abnormalities (such as dystopias) and/or exfoliation abnormalities (such as ankylosis or reinclusion of a temporary tooth) may be associated[4].

In European populations, the estimated prevalence of oligodontia varies from 0.8‰ to 1.6‰ depending on the studies[5].

The management of this pathology is complex and constitutes a real challenge leading to a multidisciplinary approach. Indeed, due to its numerous repercussions on dentofacial growth, the management of oligodontia requires the collaboration of several specialists: orthodontist, dentist, oral and maxillofacial surgeon[6,7].

The orthodontist will manage the spaces necessary for the placement of dental implants, he should also be able to carry out a treatment within the framework of a possible orthognathic surgery if there is a dentofacial deformity[8].

The mission of the paedodontist will be to set the provisional prosthesis compensating the edentulous areas while waiting for the end of growth and waiting for implant surgery; the prosthodontist will perform the implant-borne fixed denture[9–11].

The oral and maxillofacial surgeon will perform the surgical part of the management.

A preimplant surgery is necessary if the bone volumes are insufficient. This situation is due to the absence of alveolar growth related to the absence of the dental organ.

Orthognathic surgery is sometimes mandatory when there are orthodontic difficulties but also when skeleton discrepancies are present due to the growth disturbances of the face. Finally, he will perform the placement of dental implants[12,13].

In this study, we focused exclusively on patients who had insufficient bone volumes, which did not allow the placement of dental implants in a prosthetic corridor, within the context of oligodontia. The aim of this study was to assess the vertical and transverse bone increase following autogenic bone grafting to realize an implant-borne fixed denture, and to discuss the prosthetic options in these patients.

Materials and methods

Sample

We carried out a retrospective study of 20 patients followed and treated in our oral and maxillofacial surgery department for oligodontia from 2008 to 2019.

Patients who had insufficient bone volumes, which did not allow the placement of dental implants in a prosthetic corridor without bone grafting, were eligible for this study and were included if orthodontic/surgical/prosthetic management were performed. Exclusion criteria were incomplete documentation or uncompleted management of the patient.

Treatment plan

The treatment plan could be characterized by up to six axes: preoperative provisional removable prosthetic rehabilitation; orthodontic treatment; orthognathic surgery; graft surgery; implant surgery; implant-borne fixed denture.

The surgical objectives were to correct inter-arch relationships in case of dentofacial deformities and to prepare placement of dental implants by autologous bone grafts with or without nerve lateralization. The implant and prosthetic phase were the last step: after dentascan, with a radiological guide, implantation was performed 6 months after orthognathic surgery and/or bone reconstruction; the prosthetic stage was started 4–6 months after implant placement.

Bone grafting surgical procedures

Harvesting site was always parietal bone: strips of cortical bone from the external layer of the parietal bone combined with diploe bone scraping[14].

Le Fort I osteotomy associated with bone grafting: after Le Fort I osteotomy and detachment of the sinus membrane from the sinus floor, maxillary sinus was filled by scraped bone covered by bone plates fixed with titanium screws; then osteosynthesis of the grafted maxilla was performed in the determined position according to the orthognathic and prosthodontic planning[15] (Fig. 1).

Maxillary or mandibular horizontal grafting: autogenous bone blocks were screwed on edentulous area, empty spaces were filled with particulate bone[16–18].

Sinus lift realized by lateral approach: an osteotomy performed on the lateral maxillary wall was carried out associated with an elevation of the sinus membrane and placement of bone graft[19].

After each grafting procedure, antibiotic protocol was: amoxicillin/clavulanic acid 1 g/125 mg three times daily for 14 days, then twice daily for 7 days. In penicillin-allergic patients, antibiotic protocol was: pristinamycin 1 g three times daily for 14 days, then twice daily for 7 days.

Alveolar nerve lateralization was also performed in some patients, by an external cortical bone osteotomy of the mandibular corpus[20].

Evaluation

Measurements of bone increase were made on preoperative and 6 months postoperative computed tomography (CT) scans.

Concerning horizontal grafting, transverse bone increases were measured at the level of the apical third of the adjacent tooth to the grafted area, mesial or distal tooth (Fig. 2).

Regarding to sinus lifts, vertical bone increase was measured from the top of the alveolar ridge to the floor of the maxillary sinus (Fig. 3).

Maxillary bicuspids and molars zones were the only areas where vertical ridge augmentation was sometimes necessary by sinus lift. In the other grafted areas, small bone thickness was associated with a preserved bone height, without vertical component in the defect, thus only requiring horizontal grafting. CT coronal reconstructions showed a 'water droplet' image characteristic of agenesis cases. The number of implants placed was recorded.

Implant survival rate was assessed using last dental panoramic radiography taken during the last follow-up consultation, and the clinical follow-up noted in the medical record.

Results

Twenty patients were included in the study (Fig. 4): six females and 14 males, aged from 15 to 38 years old when bone grafting was performed (mean age 21 years).

The mean number of ageneses was 14 per patient, from seven to 26 ageneses.

Ten patients underwent an orthognathic surgery: four patients underwent only isolated maxilla osteotomy, one patient underwent only isolated mandible osteotomy and five patients underwent bimaxillary osteotomy.

Two patients underwent only isolated Le Fort I osteotomy associated with bone grafting; 10 patients underwent only isolated horizontal grafting; three patients underwent Le Fort I osteotomy associated with bone grafting combined with horizontal grafting; five patients underwent horizontal grafting combined with sinus lift by conventional lateral approach. Two patients underwent nerve lateralization.

Sixteen patients underwent horizontal grafting on their premaxillary area and/or their premolar area. In these patients, their mean preoperative bone width was 5.33 mm [standard deviation (SD) 1.15 mm] and their mean postoperative bone width was 10.10 mm (SD 1.17 mm). Eleven patients underwent horizontal grafting on their mandibular incisive-canine area and/or their premolar area. In these patients, their mean preoperative bone width was 6.35 mm (SD 1.67 mm) and their mean postoperative bone width was 10.46 mm (SD 1.97 mm). Mean of horizontal grafting increase was 4.60 mm (SD 0.79 mm) (+85%).

Ten patients underwent sinus lift realized by lateral approach or associated with a Le Fort I osteotomy. In these patients, their mean preoperative bone height was 5.17 mm (SD 2.42 mm) and their mean postoperative bone height was 15.12 mm (SD 2.60 mm). Mean of sinus lift increase was 9.95 mm (SD 2.35 mm) (+257%).

These results are presented in Fig. 5.

The mean number of implants placed was nine per patient. The mean number of implants placed on grafted site was five per patient.

All the grafted sites were implanted in the prosthetic corridor with a view to making an implant-borne fixed denture, on average 6 months and 8 days after preimplant surgery.

Follow-up ranged from 9 months to 7.5 years after implants placement: no patient suffered from an osseointegration failure, the overall implant survival rate was of 100%. All patients benefited from prosthetic procedures when they were planned, 4–6 months after implants placement, to perform an implant-borne fixed denture.

All results are listed in Table 1.

Tables 2 and 3 outlines indications, presence or not of an accompanying syndrome, Cawood classification, Terheyden & Cordaro classification, type of prosthesis made, lengths of follow-up after grafting and after implants placement and occurrence of potential postoperative complications.

Discussion

Management of oligodontia involves multidisciplinary cares over a long period of time.

Treatment of this condition is complex and requires in some cases a dentofacial orthopaedic management combined with orthognathic surgery and preimplant grafting, as facial growth is in most of the cases disrupted[21].

Among our 20 selected patients, half underwent an orthognathic surgery. Le Fort I osteotomy associated with bone grafting was performed in five cases. This technique allows simultaneous improvement of the interarch relationships in case of jaws discrepancy (combined or not to a sagittal osteotomy of the mandible) and preparation for the placement of implants by grafting the future implanted areas. Indeed, these dental defects – included or not in a genetic syndrome – cause a dentoskeletal discrepancy leading to a particular morphotype[22]. This technique is reliable and is also used to cure complications of previous biomaterials grafted in the maxillary sinuses[23]. Our results are comparable to those of Schlund et al. who highlighted a mean increase of bone height of 9.2 mm by sinus grafts and a mean increase of bone width of 5.9 mm by onlay and horizontal grafting, in 66 patients with severely resorbed maxilla[14]. Le Fort I osteotomy is chosen in case of anterior dental gap to restore dentoskeletal class I normoclusion and avoid onlay grafting in this area where resorptions may be important. This technique also allows the reduction of excessive prosthetic space by lowering the position of the palatal plate. Only the transversal dimension remains a difficulty because occlusal relationships can remain inverted in the posterior sectors despite onlay and horizontal grafting. A disjunction can be difficult to implement on a maxillary significantly transversely reduced and resorbed.

In a large majority of cases, the preserved bone height is associated with a small bone thickness. CT coronal reconstructions show a 'water droplet' image characteristic of these cases of agenesis, making these bone volumes inoperable for implant surgery. In these cases, horizontal grafting is necessary. Horizontal and onlay grafting success rate was 74% in Torres et al.'s study who assessed this surgical technique in 19 patients treated for severe atrophic anterior maxilla between 2002 and 2012[18]. In Ferri et al.'s study, implant insertion success was 97% and there was no infection in cases of onlay and horizontal grafting in 21 patients[15]. Bone grafts come from diverse origins. However, parietal bone remains the best harvesting site due to its low resorption and the amount of available bone[24]. In our hands, calvarial grafting procedures lead to good results[25]; they are performed at the end of the growth or adulthood in the absence of general contraindication. No donor-site complication occurred in our sample. Furthermore, calvaria harvest is associated with lower morbidity compared with iliac crest bone harvest, postoperative course is simple and surgical recovery is faster[26,27]. Regarding the use of bone substitutes, Sakkas et al. revealed several key findings: autologous bone combines osteoconductive, osteoinductive, and osteogenic properties compared to bone substitute; 3–6 months of healing are necessary, substitute bone requires at least 6 months of healing in the best-case scenario; on another note, success rates exceeding 95% have been notified with autologous bone, even when major augmentation procedures with autologous bone had to be carried out for severely resorbed jaws[28]. Nerve lateralization is performed when the inferior alveolar nerve has a high position and if an onlay graft would reduce

prosthetic space excessively[29]. The implant phase is discussed and planned from the beginning of the therapeutic project.

Five to six months after the preimplant surgery, a dentascanner or cone beam CT (CBCT) was performed with a radiological guide according to the prosthetic study, which can be transformed into a surgical guide. Implant-borne fixed dentures are the gold standard for these complex rehabilitations. In large edentation cases or in case of anomalies of the vertical dimension, it is better to use transitional implant-borne dentures, in order to secure the occlusal scheme, before making the final prostheses.

The final dentures are linked for biomechanical reasons, proscribing any tooth–implant connection[30,31].

Implant survival rate in our study confirms the reliability of this management of oligodontia. Our results are the same as those reported by Chiapasco et al.[32–34] with regard to horizontal grafting and sinus elevation, comparable but slightly better than those reported by De Santis et al.[35] and Stoelinga et al.[36] with regard to Le Fort I osteotomy associated with bone grafting; Torres et al.[18] also highlighted an implant survival rate of 100% in non-smoker patients with regard to onlay and horizontal grafting for atrophic anterior maxilla.

With regard to the financial aspect, it should be noted that the French national system of health insurance covers a maximum of 10 implants in order to leave a removable prothesis stabilized on implants which is also covered, but fixed prostheses (single crowns or bridges) do not belong to specific reimbursement even if are possibly managed by private insurance; bone and gingival grafts are

covered. Health systems are not the same all over the world, and this is particularly true for the oligodontia. A larger understanding would be desirable so that an evolution in this area could take place. In a patient with anodontia (characterized by absence of all teeth) or severe oligodontia associated with dental extractions of remaining non-conservable teeth driven by prosthetic treatment, we aim to place six maxillary implants and six mandibular implants with a view to making implant-borne fixed complete dentures (Fig. 6). Literature shows that a denture can be screwed on four implants in the maxilla or the mandible[37,38], but it is recommended to place six implants whenever possible. Indeed, in their study, Brånemark et al. showed that there is a significantly increased risk to lose one or more implants when only four instead of six are placed to support a fixed denture; the situation can become complex to manage if one of the four implants is lost, forcing the practitioner to plan a new surgical intervention to reach the minimum number of abutments on the arch[39]. From a biomechanical point of view, Brunski explained that the masticatory forces are better distributed on a prosthesis fixed on six implants instead of four, thus reducing the risk of prosthetic fracture, biomechanical stress on each implant is less important in this situation[40]. Furthermore, the All-on-4® concept is associated with a greater length of distal cantilever of the implant-borne fixed denture, which can increase the stress on the distal implants and the risk of prosthetic fracture too[41,42].

Terheyden and Wüsthoff's study confirms our strategy of rehabilitating these patients with implants at the end of growth. By comparing implants, dental autotransplants, temporary teeth preservation and tooth-supported fixed prosthesis

290 in patients with agenesis, they showed that implants yield the best results in terms
291 of survival/success rates, oral health-related quality of life and satisfaction[43].
292 Autotransplantation and temporary teeth preservation can be used as a temporary
293 solution until completion of growth and implants placement. However,
294 autotransplantation requires careful case selection, professional skill,
295 patient/parent collaboration and is associated with short-term clinical experience[44].
296 Furthermore, these techniques and temporary teeth preservation should not
297 impede the proper conduct of orthodontic treatment. Lastly, ankylosis, infection, or
298 reinclusion are some risks related to these two techniques to be taken into account
299 which should not complicate the treatment plan.
300 With proper dental treatment, patients with oligodontia can have normal
301 dentition and orofacial functions[45] (Fig. 7). Our study shows that bone grafting
302 combined or not with an orthognathic surgery allows reconstruction of favourable
303 bone volumes for placement of dental implants to realize implant-borne fixed
304 dentures in these patients. This surgery must be part of a complete treatment plan
305 involving paediatric dentistry, dentofacial orthopaedics, oral and maxillofacial
306 surgery, and prosthodontics.
307 The authors believe that removable prosthetic rehabilitation is not a good
308 solution for patients with oligodontia who are often very young (mean age 21 years
309 when bone grafting was performed in our patients), and that they should have the
310 right to benefit from a fixed denture which greatly improves quality of life from both
311 a functional and aesthetic point of view. Currently, this last phase of such treatment
312 is expensive and poorly covered by health insurance.

In order to be able to offer a fixed denture to the patient, there are no compromises to be made regarding the position of the implants, preimplant bone grafting can therefore be necessary to place the implants in a correct buccopalatal/buccolingual position, as we saw in the patients in our study (Fig. 8).

Lastly, it should be stressed that the motivation and the involvement of the patient for many years must be maintained, because treatment of this pathology is complex and spread over several months or even years.

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Competing interests

None.

Ethical approval

No ethical approval required.

Patient Consent

No patient consent needed.

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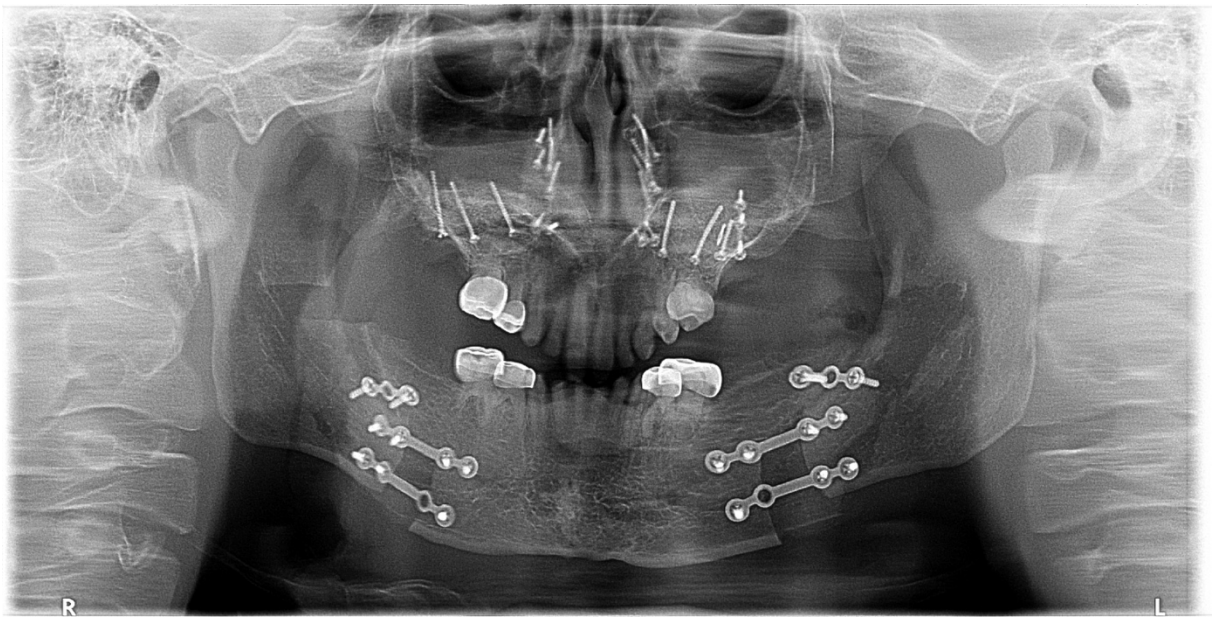
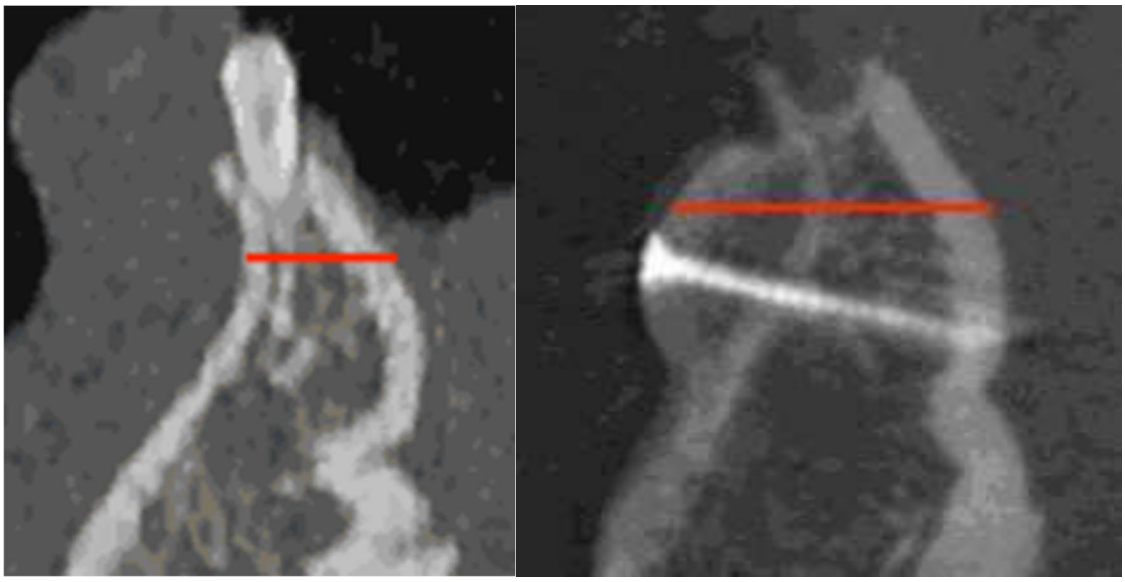
Figure 1:



Figures 2A and 2B:



Figures 3A and 3B:

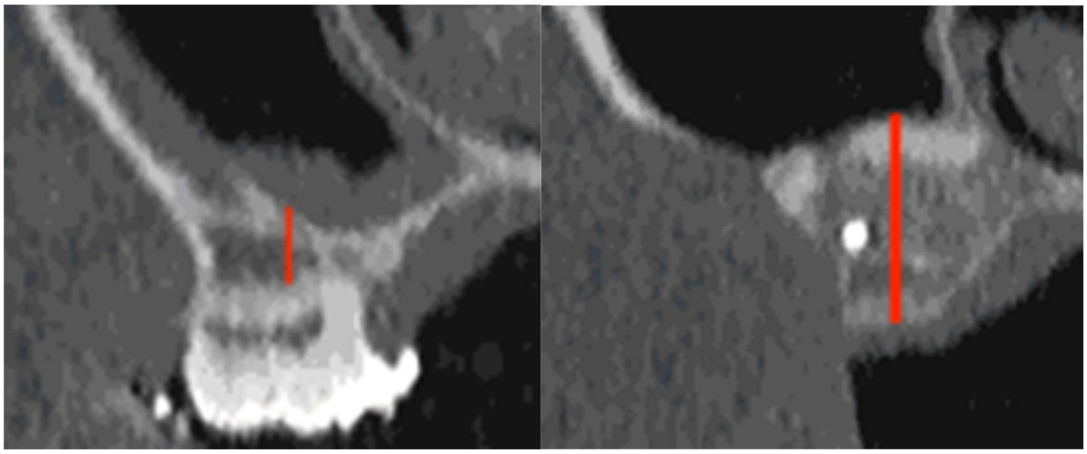


Figure 4:

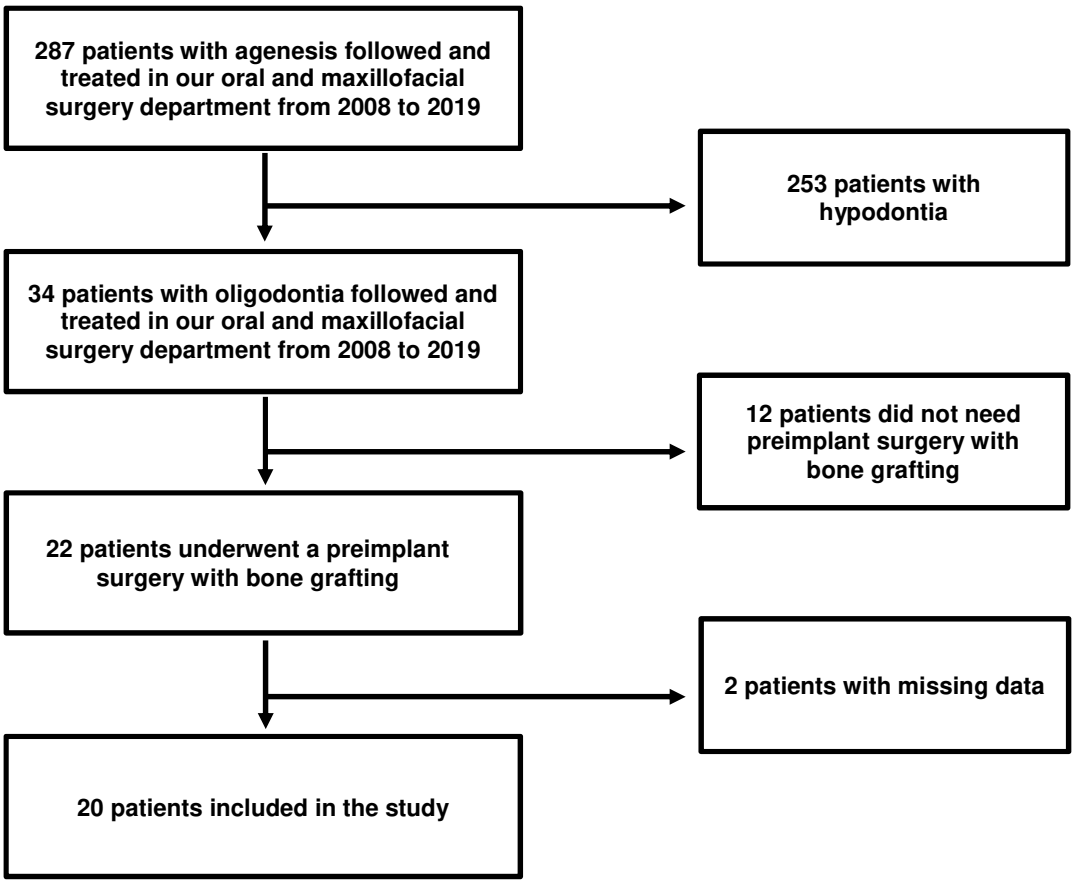

287 patients with agenesis followed and treated in our oral and maxillofacial surgery department from 2008 to 2019
253 patients with hypodontia
34 patients with oligodontia followed and treated in our oral and maxillofacial surgery department from 2008 to 2019
12 patients did not need preimplant surgery with bone grafting
22 patients underwent a preimplant surgery with bone grafting
2 patients with missing data
20 patients included in the study

Figure 5: Bone increase after horizontal grafting or sinus lift

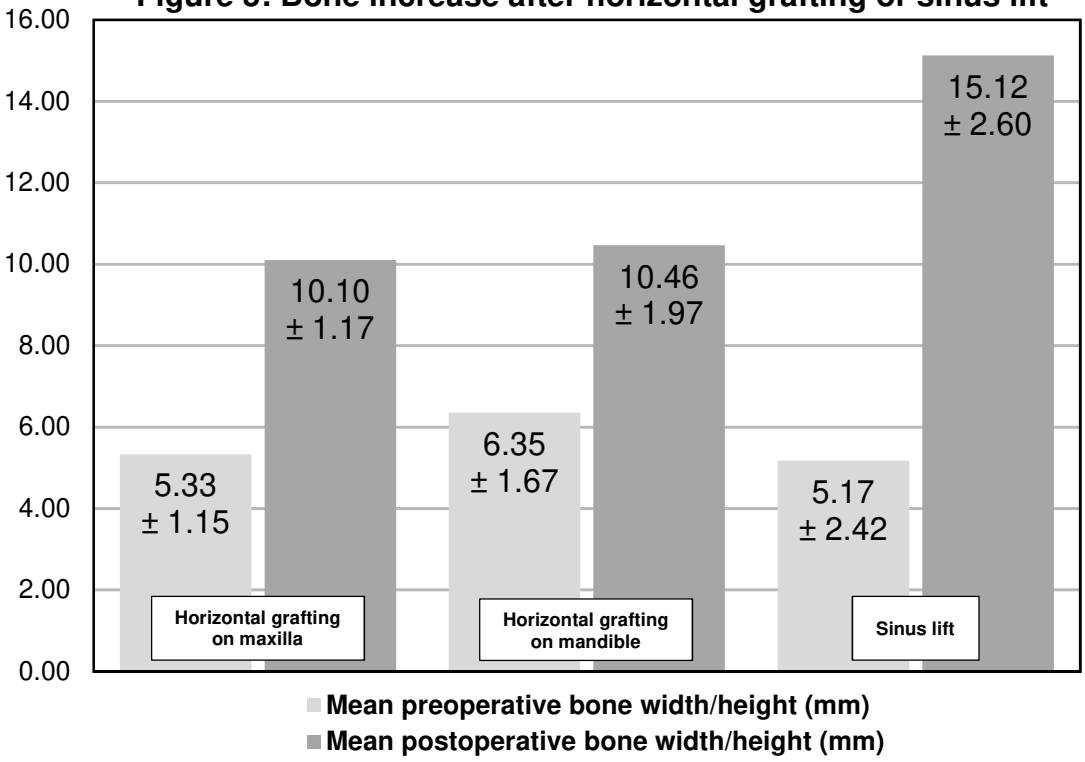
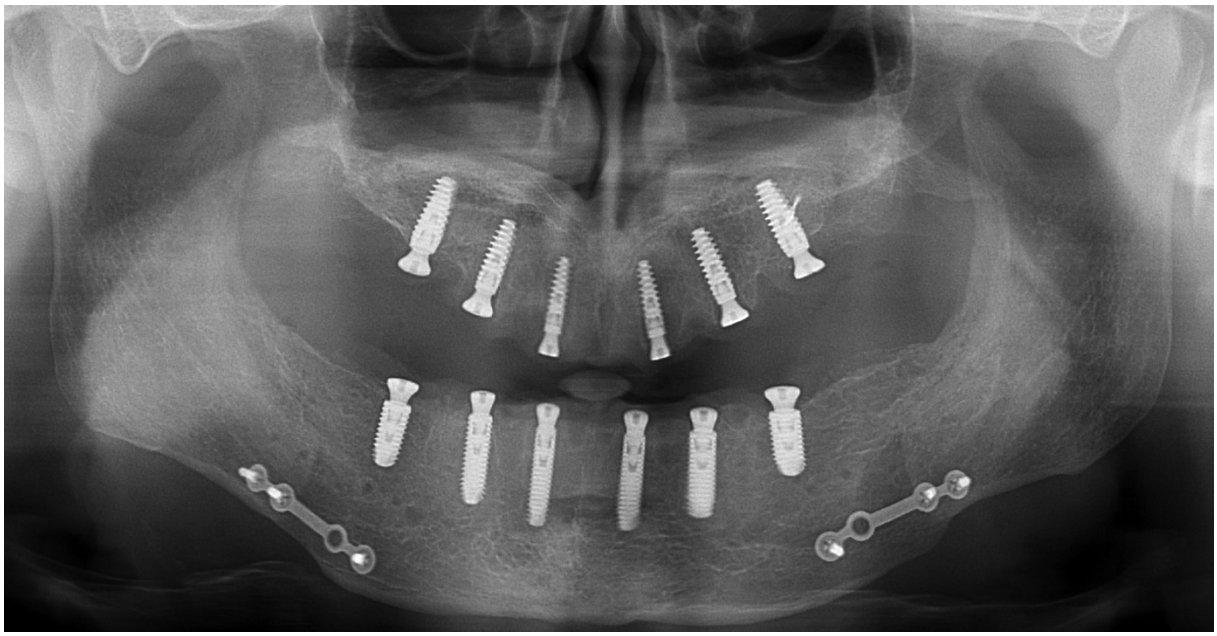


Figure 6:



Figures 7A, 7B and 7C:

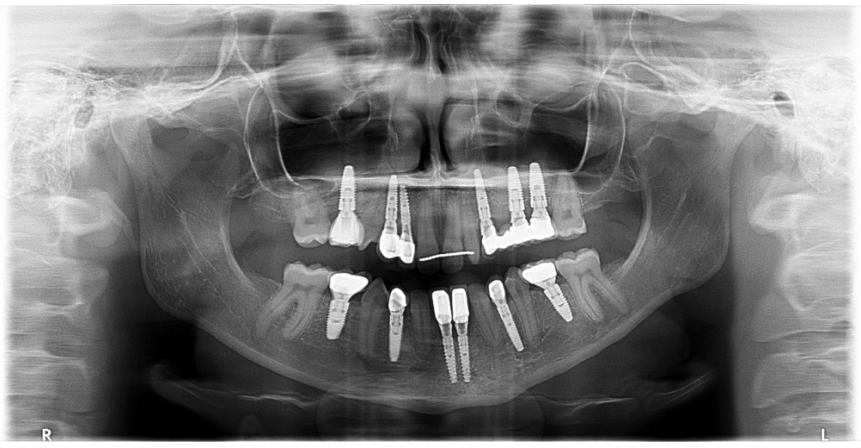


Figure 8:

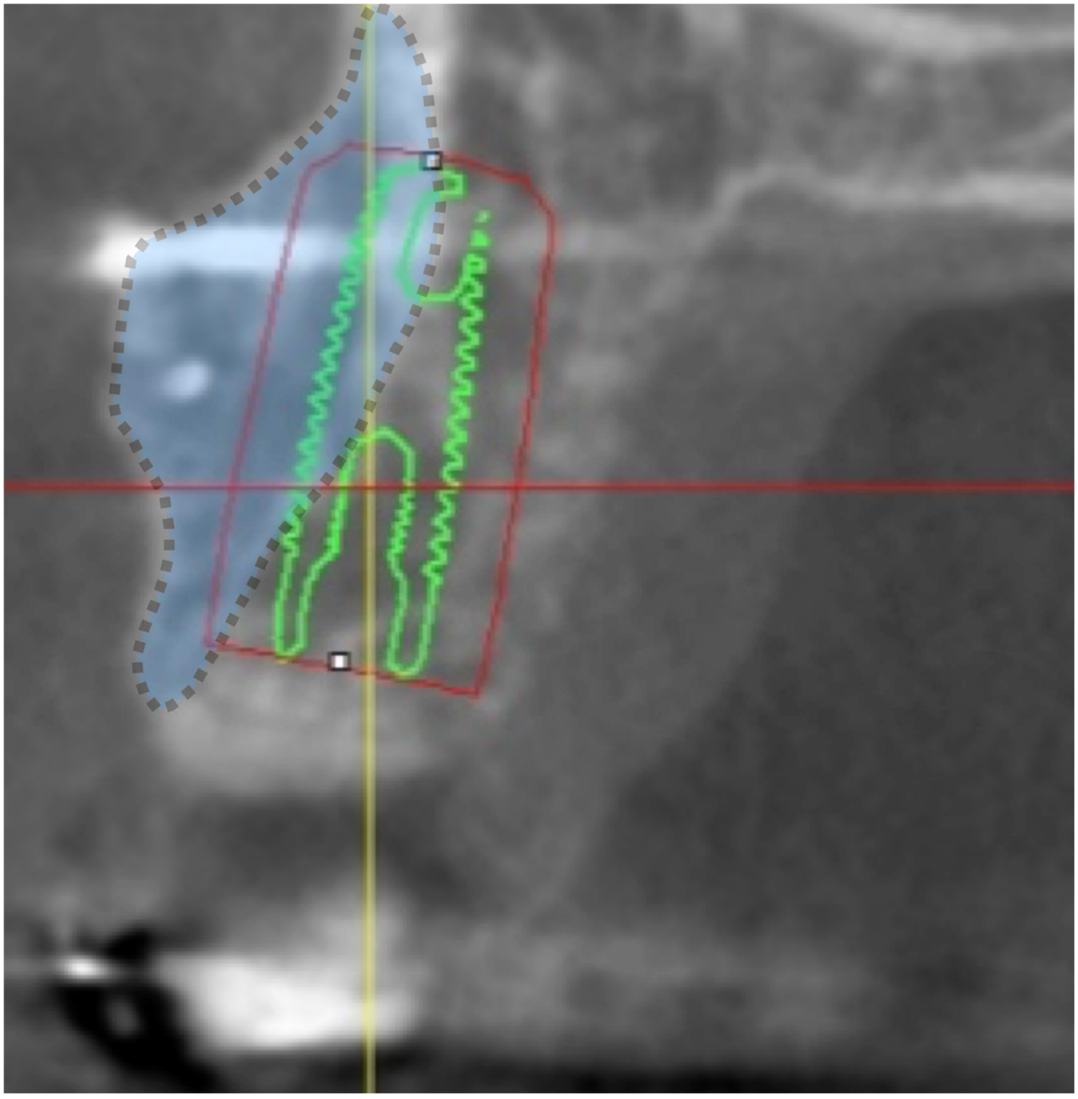


Table 1: Patients' data

								Horizontal grafting on maxilla (mm)		Horizontal grafting on mandible (mm)		Sinus lift (mm)		Mean increase (mm and %)			
Patient	Number of agenesis	Maxilla osteotomy	Mandible osteotomy	Le Fort I + bone grafting	Horizontal grafting	Sinus lift by lateral approach	Nerve lateralization	Mean preoperative bone width	Mean postoperative bone width	Mean preoperative bone width	Mean postoperative bone width	Mean preoperative bone height	Mean postoperative bone height	Horizontal grafting	Sinus lift	Number of implants	Number of implants on grafted site
1	16	Yes	Yes	Yes	Yes	No	No			3.75	8.10	3.75	15.35	4.35 (+116%)	11.60 (+309%)	10	4
2	10	Yes	No	No	Yes	No	No	4.50	10.40					5.90 (+131%)		4	1
3	11	No	No	No	Yes	No	No	5.87	10.90	5.70	10.55			4.94 (+85%)		7	5
4	10	No	No	No	Yes	No	No	6.05	10.70					4.65 (+77%)		7	2
5	7	No	No	No	Yes	Yes	No	7.25	10.80	8.50	13.80	5.50	15.30	4.43 (+56%)	9.80 (+178%)	6	6
6	16	Yes	No	No	Yes	No	No			6.95	10.75			3.80 (+55%)		10	4
7	19	Yes	No	Yes	Yes	No	Yes	5.95	10.65			2.10	15.05	4.70 (+79%)	12.95 (+617%)	13	5
8	13	Yes	Yes	Yes	No	No	No					4.10	15.40		11.30 (+276%)	8	3
9	10	No	No	No	Yes	No	No	4.35	7.00	6.95	10.60			3.15 (+57%)		6	6
10	10	No	No	No	Yes	Yes	Yes	6.25	9.68	6.70	9.00	6.55	11.70	2.87 (+45%)	5.15 (+79%)	9	6
11	12	Yes	Yes	No	Yes	No	No	5.45	10.33	5.90	9.60			4.29 (+76%)		8	6
12	17	No	No	No	Yes	Yes	No	6.78	10.83	6.10	11.10	6.35	13.50	4.53 (+71%)	7.15 (+113%)	10	8
13	14	No	Yes	No	Yes	No	No	5.15	9.45					4.30 (+84%)		9	4
14	16	No	No	No	Yes	Yes	No	3.75	8.45	6.25	10.55	2.15	12.55	4.50 (+97%)	10.40 (+484%)	12	8
15	21	No	No	No	Yes	No	No	4.23	9.57					5.34 (+126%)		10	5
16	16	Yes	Yes	Yes	Yes	No	No	6.50	11.78			9.50	21.20	5.28 (+81%)	11.70 (+123%)	8	6
17	15	Yes	No	No	Yes	No	No	3.40	9.55	9.25	13.55			5.23 (+114%)		9	4
18	10	No	No	No	Yes	Yes	No	5.67	11.40			3.80	14.45	5.73 (+101%)	10.65 (+280%)	6	6
19	26	Yes	Yes	Yes	No	No	No					7.85	16.65		8.80 (+112%)	12	4
20	8	No	No	No	Yes	No	No	4.10	10.10	3.80	7.42			4.81 (+121%)		7	6

Table 2: Indications and accompanying syndromes

Patient	Indication	Accompanying syndrome
1	Persistence of resorbed temporary teeth 53-54-55-64-65-75-85 Gap in sites of teeth 12-22, 33 to 43	0
2	Reinclusion of temporary teeth 75-85 Agenesis of 17-27-37-47 (free-end space) Gap in site of tooth 22	Cleft lip and cleft palate
3	Gap in sites of teeth 12-17-22-32-42 Persistence of resorbed temporary teeth 65-71-81 Persistence of resorbed permanent teeth 36-46	0
4	Persistence of resorbed temporary teeth 55-63-75 Gap in sites of teeth 12-24-34-35	0
5	Reinclusion of temporary teeth 55-65-71-81 Gap in sites of teeth 14-24	0
6	Gap in sites of teeth 12-14-16-17-22-24-26-27-31-32-33-36-37-41-42-46 Morphological abnormalities on the remaining teeth	0
7	Agenesis of 37-47 (free-end space) Persistence of resorbed temporary teeth 53-55-65-71-73-74-75-81-83-84-85 Gap in sites of teeth 12-22-24	0
8	Agenesis of 17-27-37-47 (free-end space) Persistence of resorbed temporary teeth 53-65-75-85 Reinclusion of temporary teeth 64 Gap in site of tooth 23	0
9	Gap in sites of teeth 12-22-31-32-34-41-42-44	Ectodermal dysplasia
10	Gap in sites of teeth 12-15-22-34-36 Persistence of resorbed temporary tooth 71-75-81-83	Ectodermal dysplasia
11	Gap in sites of teeth 12-14-22-24-25-35-31-41-45 Agenesis of 17-37-47 (free-end space)	0
12	Gap in sites of teeth 12-13-14-15-22-23-24-25, 33 to 43 Agenesis of 27-37-47 (free-end space)	0
13	Gap in sites of teeth 34 to 43 Agenesis of 17-37-47 (free-end spaces) Persistence of resorbed temporary teeth 52-53-62-63	0
14	Reinclusion of temporary teeth 55 Persistence of resorbed temporary teeth 52-53-63-64-65-71-73-75-81-83-85 Agenesis of 17-27-37-47 (free-end spaces)	0
15	Agenesis of 35 to 45 Gap in sites of teeth 24-25 Agenesis of 17-27-37-47 (free-end spaces) Persistence of resorbed temporary teeth 52-53-55-62-63	0
16	Agenesis of 17-37-47 (free-end spaces) Reinclusion of temporary teeth 75-85 Reinclusion of temporary teeth 52-53-54-55-62-65-71-81 Gap in sites of teeth 24-34-44	Frontometaphyseal dysplasia
17	Gap in sites of teeth 12-14-22-24, 33 to 43 Persistence of temporary teeth 55-65-74-75-85	Ectodermal dysplasia
18	Agenesis of 27-37-47 (free-end space) Gap in sites of teeth 12 to 15 and 23 to 25	0
19	Persistence of resorbed temporary teeth 52 to 55, 62 to 65, 71 to 75, 81 to 85	0
20	Persistence of resorbed temporary teeth 52-53-63-82-83-73 Gap in site of tooth 22	0

Table 3:

Patient	Cawood classication	Terheyden & Cordaro classification	Prosthesis type	Length of follow-up after grafting	Length of follow-up after implants placement	Complications
1	53-54-55-64-65-75-85: V 12-22, 33 to 43: IV	53-54-55-64-65-75-85: 4/4 12-22, 33 to 43: 2/4	Bridges and single crows	1 yr 2 mos	0 yrs 8 mos	0
2	22: IV	22: 2/4	Single crows	1 yr 4 mos	0 yrs 10 mos	0
3	12-17-22-31-32-41-42: IV	12-17-22-31-32-41-42: 2/4	Bridges and single crows	1 yr 2 mos	0 yrs 8 mos	Early bone graft exposure and peri-implant bone resorption (2 mm) in site of 46, without consequences
4	12-23: IV	12-23: 2/4	Single crows	3 yrs 7 mos	2 yrs 9 mos	0
5	14-31-41: IV 15-24-25: V	14-31-41: 2/4 15-24-25: 4/4	Single crows	2 yrs 11 mos	2 yrs 4 mos	0
6	32-33-42-43: IV	32-33-42-43: 2/4	Bridges and single crows	1 yr 8 mos	1 yr 2 mos	0
7	15-25: VI 12-13-23: IV	15-25: 4/4 12-13-23: 2/4	Bridges and single crows	2 yrs 0 mos	1 yr 6 mos	0
8	15-24-25: V	15-24-25: 4/4	Single crows	4 yrs 9 mos	4 yrs 2 mos	0
9	12-22-32-34-42-44: IV	12-22-32-34-42-44: 2/4	Single crows	3 yrs 4 mos	2 yrs 10 mos	0
10	15-25: V 12-22-43: IV	15-25: 4/4 12-22-43: 2/4	Single crows	4 yrs 2 mos	3 yrs 7 mos	0
11	31-41-12-14-22-24: IV	31-41-12-14-22-24: 2/4	Single crows	2 yrs 2 mos	1 yr 8 mos	0
12	33 to 43, 13-23: IV 14-15: V 24-25: VI	33 to 43, 13-23: 2/4 14-15-24-25: 4/4	Bridges and single crows	3 yrs 6 mos	3 yrs 0 mo	0
13	12-13-22-23: IV	12-13-22-23: 2/4	Bridges and single crows	5 yrs 2 mos	4 yrs 7 mos	0
14	12-13-23-31-41: IV 15-25: VI	12-13-23-31-41: 2/4 15-25: 4/4	Bridges and single crows	3 yrs 6 mos	3 yrs 0 mos	0
15	12-13-22-23-25: IV	12-13-22-23-25: 2/4	Bridges and single crows	4 yrs 8 mos	4 yrs 2 mos	0
16	12-14-15-22-24-25: IV	12-14-15-22-24-25: 2/4	Bridges and single crows	4 yrs 8 mos	4 yrs 2 mos	0
17	14-24-33-43: IV	14-24-33-43: 2/4	Bridges and single crows	3 yrs 4 mos	2 yrs 11 mos	0
18	13-23: IV 15-25: VI 14-24: V	13-23: 2/4 14-15-24-25: 4/4	Bridges and single crows	7 yrs 3 mos	6 yrs 11 mos	0
19	16-26: V	16-26: 4/4	Bridges	2 yrs 2 mos	1 yr 9 mos	0
20	33 to 43, 12-13, 22-23: IV	33 to 43, 12-13, 22-23: 2/4	Bridges and single crows	2 yrs 0 mo	1 yr 5 mos	0