Reconstruction of cleft palate using implants - Case Report

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Summary

Objective: Early prosthodontic therapy (usually at around 18 years of age) often leads to early loss of teeth and in extreme cases to complete loss of dentition at between 40 and 50 years of age. ***Patients:*** This report describes the treatment of two middle ages cleft patients. Edentulous maxilla with cleft defect was treated with screw-retained prosthesis supported by 6 implants (STI-BIO-C, IMPLADENT, LASAK, Ltd., Czech Republic). ***Results:*** Treatment of the whole dental arch on the basis of implants is currently frequently used as it provides a possibility of thorough functional and aesthetic therapy to a patient. The biomechanics of the reconstruction enables individual adjustment of the shape of the dental arch. ***Conclusions:*** The problem in cleft patients involves altered relations in the dental arch caused by the defect alone or also by affecting of the growth of the maxillary segment by surgery. A potentially removable framework is therefore the main method of choice because the position of the implants must be prosthetically modified.

Introduction

Based on the statistical data, the mean incidence of all types of cleft defects in the orofacial area in Czech Republic is 1.86 per 1000 live-born children[1, 2]. The number of the affected people in individual years depends mainly on the birth-rate. The maximum number of children with orofacial cleft was born in the Czech Republic in 1975 with 236 children with orofacial cleft registered[1]. Because of the low birth-rate in recent years the number of affected children with orofacial cleft fell below 100. The registry of hereditary defects was established in the Czech Republic in 1964[3], and it currently has a record of more than 4500 families with orofacial cleft in Bohemia and Moravia[4, 5].

An integrated classification of cleft defects approved by the international congress of plastic surgeons in 1967 in Rome divides clefts into three groups: primary palate clefts, primary and secondary palate clefts and secondary palate clefts[6].

Cleft defects occur in all races, ethnic groups and families of all social classes regardless of education level or their economic standard. However, there are racial differences in the rate of clefts and incidence of single types of clefts.

The lowest incidence of this defect is in the Black population[7]. The Caucasian population is affected by clefts approximately three times more often than the Black and Mongoloid population and two times more often than the Caucasian population. However, these facts apply for lip clefts with or without palate clefts. As far as isolated palate clefts are concerned their incidence in the Caucasian and Mongoloid races is almost identical and it is markedly lower in the Black population[7].

It is unambiguously clear from the studies that investigated on the incidence of cleft anomalies in relation to gender that unilateral and bilateral cleft lip and palate (CLPs) as well as unilateral and bilateral cleft lip (CLs) occur more often in males. Males are affected almost twice as often as females. It has been documented that isolated palate clefts (CPs) occurred more often in females. As far as the laterality is concerned, unilateral clefts on the left occur twice as often as on the right[8]. A number of hypotheses exist to explain these differences. However, they have not been verified completely. It is stated that approximately 20% of cleft anomalies have a genetic basis; environmental influences have been found to be associated with the affliction in 10% of cases. The defect is supposed to be multifactor in the remaining 70% of affected individuals[9].

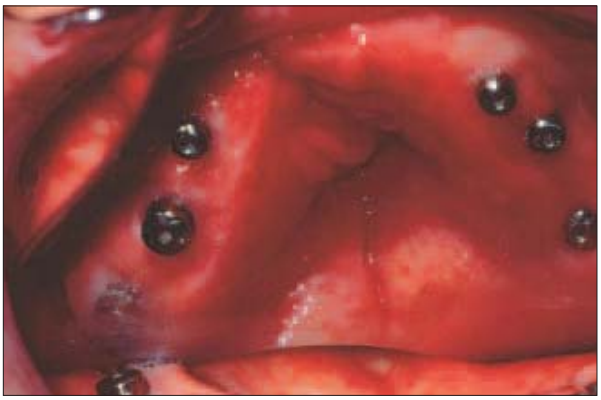

Fig. 1: Cicatricial edentulous maxilla with gingival caps (Impladent, Lasak, Ltd.)

Fig. 2: Impression for construction, individual tray (Kromopan, Lascod)

Due to the extent of affliction, interdisciplinary co-operation is necessary and usually complicated and long-term therapy, which is needed especially for gradual growth of the jaw bones, is necessary. Therefore, the final solution has to be postponed to a time when the arches are not in a growth period. The treatment should be initiated with a surgical lip correction (usually in the 3rd month of age of a child) and later with a correction of the palate (between the 1st – 4th years of age). It should be followed by orthodontic therapy that optimally achieves correction (e.g. in an isolated palate cleft) but a final prosthetic solution is needed more often (especially in complex clefts). A favorable shape and size of the dental arches without anomalies is an important factor for the prosthetic phase. A cleft defect often means that some teeth are missing (lateral incisors, more often premolars) and

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Fig. 3: Exchange of the gingival caps for abutments (Impladent, Lasak, Ltd. – diameter 3.7 mm, gingival height 1 – 2 mm)

Fig. 4: Impression copings (Impladent, Lasak, Ltd.)

Fig. 5: Test of the tray over the impression copings screwed on (Impladent, Lasak Ltd.; Duracrol, Dental)

there may be other orthodontic anomalies which include either crossed occlusion, inverse occlusion in the frontal part or various anomalies of a tooth position (inclination, rotation, etc.).

Early prosthetic therapy (usually around 18 years of age) often leads to early loss of teeth and in extreme cases to complete loss of dentition at between 40 and 50 years of age. The prosthetic therapy of edentulous patients with a cleft defect is very difficult. There are several reasons for difficulties during reconstruction and functioning of the complete dental replacements: a discrepancy in the interrelationship between the jaws bones especially due to maxillary hypoplasia, deformation and flat embossment of palatal area, augmented by resilience of the thickened mucous membrane and atypical tentacles of giant mucosal folds used for the closure of these defects. The classical full dentures have no retention and stability.

Case report

Treatment of the implant supported edentulous dental arch is currently frequently used as it provides a possibility of thorough functional and aesthetic therapy for a patient. The treatment will be demonstrated using the IMPLADENT dental implant system (LASAK, Ltd. Prague, Czech Republic). At least 6 to 8 implants have to be inserted into an edentulous jaw. As soon as they are integrated (6 months), a surgeon performs the X-ray examination (panoramic radiograph) and checks the grade of osseointegration. Until this time the implants fixtures are still covered by mucosa and sometimes they are also splinted using titanium splints. If a surgeon is satisfied with the healing process, he cuts through the mucosal cover (incision is made along the alveolar ridge) and looks for the cover screw that closes the implants. Based on the implant size a suitable healing cap is attached (Fig. 1) and a prosthodontics will wait 1 to 2 weeks until the attached gingiva is formed. The fixtures are located around the base of the upper jaw, which must be formed functionally and aesthetically during the reconstruction according to the shape of the natural dental arch.

The preparation of an individual impression tray is the first prosthetic step during reconstruction when performing metal-ceramic bridge. The alginate impression of the upper jaw is performed (Fig. 2) and an open individual custom tray from denture base resin is prepared in the laboratory. The open tray is perforated in the sites of the future abutments. The alginate impression in the opposite jaw bone is performed at the first visit and a plaster cast of the opposite dental arch is within prepared in the laboratory. Furthermore, a wax bite rim for determining of the intermaxillary relations is used.

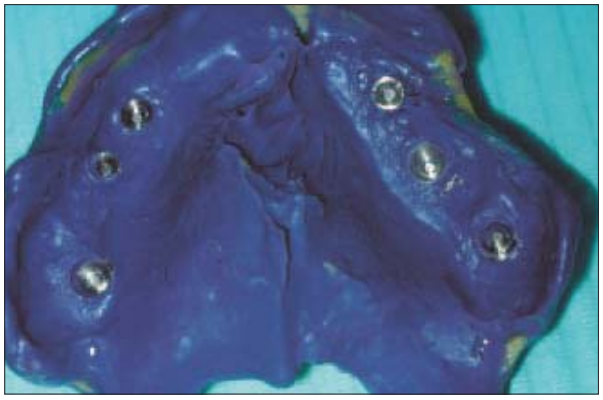

Fig. 6: Polyether impression (Impregnum 3M ESPE)

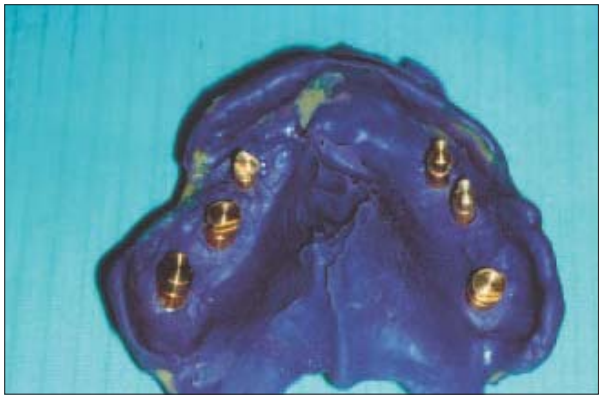

Fig. 7: Attached laboratory analogues in the impression (Impladent, Lasak, Ltd.)

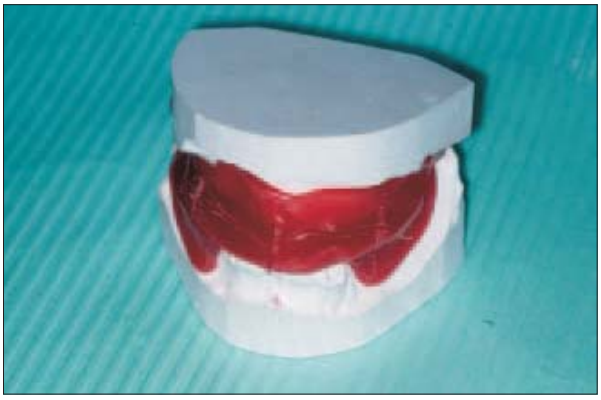

Fig. 8: Reconstruction of the maxillary relation (Plate wax, PK Dent)

Fig. 9: Master model with gingival mask and laboratory analogues with extra-hard plaster (Begotone, Bego)

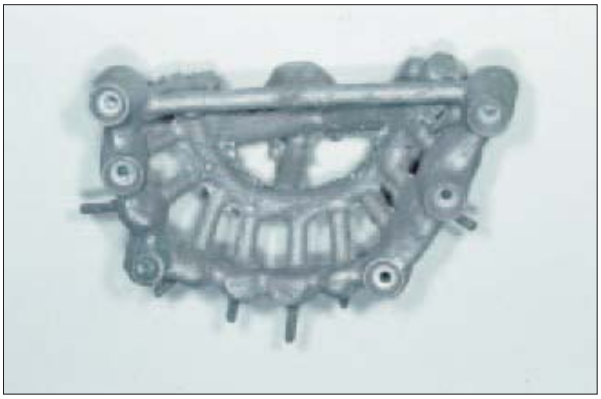

Fig. 10: Metal framework (Remanium, Bego)

Fig. 11: Passage for the screw with inserted screwdriver

A dentist unscrews the healing caps during the second visit and screws on the abutment (a prosthetic post for framework) (Fig. 3). He selects it according to the diameter of the implant. He further determines the insertion of the implant and hence the height of the attached gingiva from 1 to 4 mm. A calibrated gauge is available for this measurement. The position of the abutments must be checked using the X-ray image. Then, we attach the impression posts (Fig. 4). We try the impression try so that the posts freely pass through the openings in the tray (Fig. 5). The maxillary ridge is impressed using the polyether impression material, the posts are unscrewed and the impression is removed including the impression copings with screws (Fig. 6). The laboratory analogs are attached (Fig. 7) and it is dispatched to the laboratory. A reconstruction of the maxillary relations using the wax bite rim is a part of this visit (Fig. 8).

A dental technician fills the impression using the silicone gingival mask and creates the master model using the plaster type IV (stone) (Fig. 9). He seals the working models with the reconstructed maxillary position into the articulator. He attaches the burn-out copings on the laboratory analogues and finishes modeling the re-shape of the future construction. We used a cobalt alloy in our case and prepared the construction according to the instructions of the manufacturer (Fig. 10).

The technician must continually view the free track of the screws of the future potentially removable framework (Fig. 11). As for the adjustment of the vertical maxillary relation, the construction is often sectional with the addition of pink ceramics simulating marginal gingiva (Fig. 12).

After proving the metal framework, the bridge is completed using the ceramic material. The final evaluation is done to see whether it fulfills the functional and aesthetic requirements (Fig. 13). During the following few weeks (adaptation phase) the screw holes are closed using cotton pellet over the screw heads and glassionomer cement. The connection of the construction and implants should always be checked using an X-ray image (Fig. 14, 15).

We can also use a conditionally removable construction - Veneered resin bridge. (Fig. 16, 17, 18).

Discussion and conclusion

The problem in cleft patients involves other diameter relations in the dental arch caused by the defect alone or also by affecting of the growth of the maxillary segment by surgery. It was described that the width of the maxillary arch was higher immediately after birth because the palate plates were not connected[10, 11]. However, the antero-dorsal diameter of the maxilla between the centre of the papilla incisive and the tangent between the tubers maxillae is reduced from birth to adult age[11]. After surgery and when the patients grow, the dental arches are narrower in the measured diameters between the conoides, premolars and molars[12, 13].

A potentially removable framework is therefore the main method of choice because the position of the implants must be prosthetically modified. It allows not only to check the implant, prosthetic bearing and mucous membrane but also to simulate the insufficient amount of hard and soft tissues in the oral cavity. Therefore, it is very suitable in cleft patients where we use implant support. The amount, length and distribution are determined by the presence of the cicatrices tissue. As presented, the biomechanics of the reconstruction enables individual adjustment of the shape of the dental arch. The integration process is not affected in this defect.

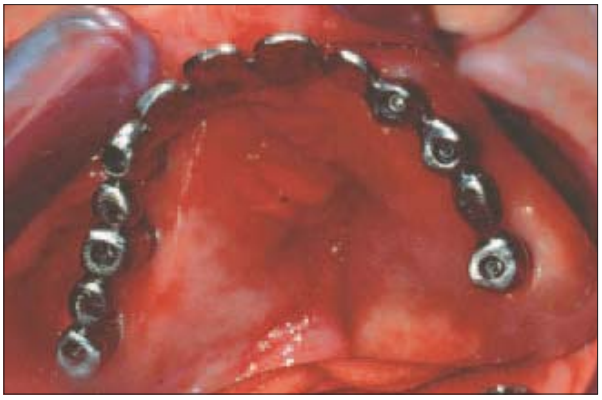

Fig. 12: Metal frame work in situ

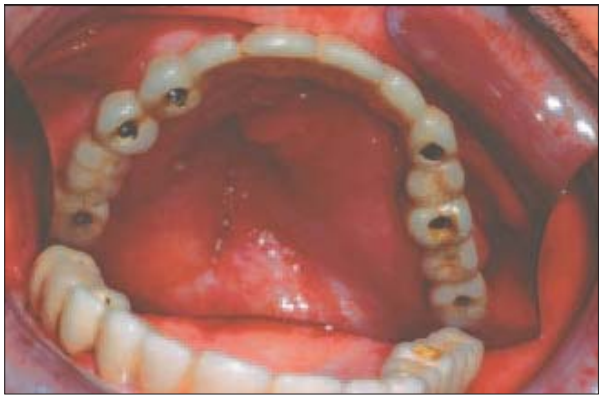

Fig. 13: Status after reconstruction, screw shafts still open

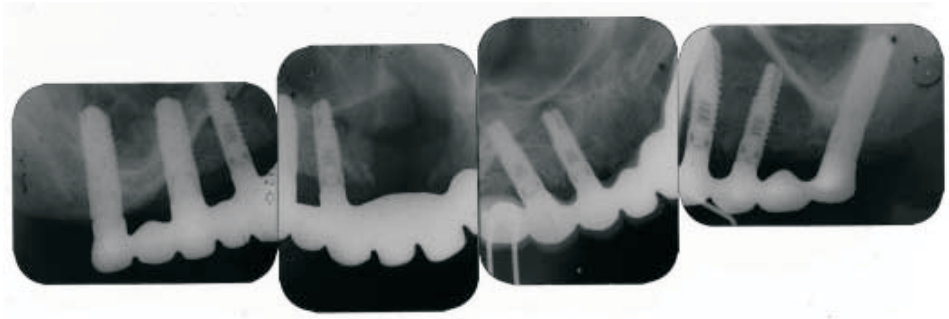

Fig. 14: X-ray image implant and framework position control

Fig. 15: Status after reconstruction

Fig. 16: Six Impladent implants – diameter 3.7 mm (Impaldent, Lasak, Ltd.)

Fig. 17: Veneered resin bridge in situ

Fig. 18: Status after rehabilitation of a patient

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