additional implants are inserted just anterior to the foramina and tilted distally about 20 degrees relative to the occlusal plane. This arrangement allows for good implant anchorage, short cantilever length and large inter-implant distance. The posterior implants typically emerge at the second premolar position.

The posterior implants are of 4 mm diameter, while the anterior ones are either 4 or 5.75 mm in diameter. Angulated abutments (Bränemark System®, Nobel Biocare AB, Göteborg, Sweden) are used. The angle is either 17 degrees or 30 degrees at the posterior implants (Fig. 7). These abutments are either 4 or 3.75 mm in diameter and typically come in conflict with the apex of the incisor and the first molar, on the maxilla. As in the standard All-on-4 technique, the bone ridge retracts (especially in cases of extreme atrophy), and the bone ridge retracts palataly when it atrophies.40 However, the placement of zygomatic anchored implants through the maxillary bone, alone or in combination with regular implants.37-39 Young and All-4 implants with an extra long implant length localize on the occlusal surfaces of the prosthetic teeth or on the internal wall of the bridge through the All-on-4 Hybrid technique aims to eliminate these difficulties by placing long implants external to the sinus, anchored in only the zygomatic bone and covered by soft tissue after emerging from the bone.

By doing so, the implant head will be positioned in a prosthetically correct position. The implants emerge in the positions between the lateral incisor and the first molar, on the maxilla is the use of implants placed in the zygomatic bone, alone or in combination with regular implants.40 The provisional prostheses are delivered after surgery (Figs. 10, 11).

Two clinical situations represent two patients eligible for a combined approach: the bone ridge retracts palataly when it atrophies.40

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The maxillary anchorage technique aims to eliminate these difficulties by placing long implants external to the sinus, anchored in only the zygomatic bone and covered by soft tissue after emerging from the bone.

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The provisional prostheses are delivered after surgery (Figs. 10, 11).
Results

Maintenance protocol

The patients are instructed to have a soft food diet for two months. Ten days after surgery, the sutures are removed (if used), and hygiene and implant stability are checked. The procedure is repeated two and four months after surgery is performed until stability is achieved.

Final prosthetic protocol

Final prostheses are delivered at six months (Fig. 16). If an adjustment of the angulated abutment was needed for better positioning of the screw access hole, the impression for the final prosthesis is taken at implant level. The abutment position is then decided at the laboratory and is adjusted in the patient’s mouth.

Implant survival criteria

Survival was based on function, individual implant stability (checked manually), absence of pain and infection, and radiographic analysis at time of evaluation.

Marginal bone level

The marginal bone level relative to the implant platform was read from periapical radiographs taken at the time of last follow-up within the study frame and at the additional follow-up for the present study. A conventional radiograph holder was used, and its position was manually adjusted for an estimated orthogonal position of the film. For a few patients, panoramic radiographs were used due to access problems.

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Results

Implant survival

The implant survival rates are presented in life tables. Tables I and II show the results for the All-on-4 standard, for the rehabilitation in the mandible and maxilla, respectively. The data concerns the routine groups as presented in the previous clinical studies plus the result from the subsequent follow-up until today.

These results show the incidence of implant losses for both the maxilla and mandible rehabilitations are low and decrease dramatically after the first six months of function, rendering high survival rates.

The preliminary results for the cumulative survival rate of the extra-maxillary anchorage implants are shown in Table III. The results indicate high survival rates with a follow-up of up to two years for the All-on-4 Hybrid and All-on-4 Extra-Maxilla implants.

Marginal bone level

The average bone levels relative to the implant platforms at one year of follow-up were 0.9 mm (SD 1.0 mm) for the maxilla and 0.7 mm (SD 0.5 mm) for the mandible. The average bone levels for the mandible at five years of follow-up were 1.7 mm (SD 1.1 mm).

Discussion

These results and the outcome from the present study indicate that immediate function for the maxilla and mandible can be highly predictable treatments (high survival rates and low marginal bone resorption), provided an optimal placement of the implants. The All-on-4 concept with implant tilting utilizes the load carrying capacity of the bone in an optimal way; the implants are spread anteriorly-posteriorly, giving an optimal prosthetic base and are well anchored in dense bone structures (anterior bone with higher density) due to the freedom of tilting.

By reducing the number of implants to four, each implant can be optimally placed without any compromise to adjacent implants. The data supports that this biomechanical optimization of the implant positions is clinically effective. The fact that the prostheses survival could be kept at 100 percent, even with less than four implants supporting the prosthesis, also demonstrates the efficacy of the implant positions.

Moreover, using finite element analysis, it is possible to conclude that there is a biomechanical advantage in using splinted, tilted distal implants rather than axial implants supporting distal cantilever units when comparing the coronal stress.

The use of only four implants simplifies many aspects of the treatment: a more aesthetic prosthesis can be manufactured, it simplifies the manufacture of the prosthesis, it reduces the risk for prosthetic complications, and it simplifies the patient’s dental hygiene procedure.

Conclusions

In conclusion, the All-on-4 immediate function concept for completely edentulous jaws has proven to be clinically effective, patient pleasing and applicable in many situations where otherwise more complicated procedures would have been indicated.

It is a standardized treatment procedure than can be routinely applied to most edentulous patients with a short treatment procedure and prostheses in place and functional a few hours after the start of surgery.

It’s well adapted to further simplifications such as flapless surgery based on computer planning and can be recommended as a method of choice for rehabilitation of completely edentulous jaws.

References are available upon request from s.rendon@dtamerica.com.