

International Research Group on Reconstructive Preprosthetic Surgery

Consensus report

The report of the aims, history and activities of the International Research Group on Reconstructive Preprosthetic Surgery (IRGRPS) appeared in this Journal in 1996¹. The consensus statement that had evolved over the years of the existence of the IRGRPS was also published at that time. Since that publication, two more meetings have been held, one in Copenhagen (1997) and one in San Diego (1999).

At these meetings the consensus document was amended in view of new developments and findings that had occurred over the last four years. In addition, questions that were raised by the Group were also addressed. Answers to these questions have been formulated based on consensus opinion and supported by a literature review.

Both the consensus statement and the questions and answers are offered to the readership of this Journal as guidelines for their practice in reconstructive preprosthetic surgery. They reflect the common thoughts of a group of clinicians (surgeons and prosthodontists) who have dedicated, for a large part, their professional life to this important branch of oral and maxillofacial surgery and prosthodontics.

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1. It is recognised that bone loss in edentulous jaws is related to a variety of systemic and local factors. Systemic factors include the genetic and morphologic make-up of the individual as well as disease states causing metabolic disturbances. Local factors may include altered jaw function, adverse loading by the prosthesis, inflammation of overlying mucosa, vascular changes and surgical procedures requiring mucoperiosteal elevation. While overall bone loss in edentulous jaws presents a rather consistent pattern, there is wide variation in the rate of bone loss and resultant ridge form (see 9), which is also influenced by the period of edentulism.

2. The consequences of advanced bone loss in the edentulous jaw differ in the maxilla and in the mandible. This difference is manifested in a quantitative, qualitative, functional and spatial manner.

3. It is also recognised that bone loss in edentulous jaws leads to certain altered

aspects of function. It further changes the maxillomandibular relationship in all dimensions and reduces the support for prosthesis. It is also associated with changes of some muscle attachments which, when combined with impaired function and ageing, leads to circumoral hypotonia and collapse. This results in changes in facial form and aesthetics.

4. The overall goals of reconstructive preprosthetic surgery are to provide an environment for a prosthesis that will restore function, be stable and retentive, preserve the associated structures and satisfy aesthetics.

5. Data published in refereed journals indicate that these aims can be achieved by placement of endosteal implants, correction of the maxillomandibular relationship, improvement of hard tissue ridge form and covering soft tissues, by bone and soft tissue grafting procedures, including repositioning of muscle and mucosal attachments, or a combination of these techniques. Studies have shown that augmentation procedures using onlay and interpositional free bone grafts in combination with endosteal implants inserted at a secondary stage are satisfactory. Onlay and interpositional bone grafts in conjunction with immediate implant insertion behave less predictably but in selected cases are an alternative. Therefore, the use of free vascularised bone grafts for pure augmentation purposes would not normally be necessary. The probability of irreversible and harmful side effects, such as long-lasting or per-

manent neurosensory disturbance, should be as minimal as possible with the prescribed methods. The net result of these surgical interventions should also, if possible, contribute to a reduction of further bone loss in both arches, as well as a reduction of adverse soft tissue changes associated with wearing a prosthesis. The existing knowledge about the influence of biomechanical factors should be taken in due consideration when using implants.

6. It is recognised that the risk of adverse loading of an opposing edentulous arch may occur by natural teeth or implant-supported prostheses. Minimising this risk requires optimal planning, treatment, maintenance and patient cooperation. The patient should be informed of the possible need for preprosthetic surgery in the future in the same or opposing jaw.

7. The majority of edentulous patients adapt well to complete dentures. However, maladaptation to complete dentures, particularly in the mandible, is encountered as a result of one or more of the adverse consequences of loss of teeth. In these situations, reconstructive preprosthetic surgical procedures which optimise the denture-bearing area can be performed with favourable treatment results. Data published on application of endosteal implants alone or with adjunctive surgery indicate that denture patients may benefit from the provision of implant-supported, -retained and -stabilised prostheses.

8. The selection of either an implant-supported or an implant-mucosa supported prosthesis as appropriate treatment is influenced by many factors.

These factors include:

- patient preference
- psychological burden of edentulous state
- existing anatomy in terms of potentially available implant sites
- denture-bearing regions
- facial aesthetics
- physical and psychological health status
- patients' manual dexterity
- compliance with oral hygiene and regular maintenance visits.

9. At present, the classification based on the research of CAWOOD & HOWELL offers the most practical description of the variations in ridge resorption.

- Class I: dentate
- Class II: post-extraction
- Class III: convex ridge form, adequate height and width of alveolar process
- Class IV: knife edge form, adequate height but inadequate width of alveolar process
- Class V: flat ridge form with loss of alveolar process
- Class VI: loss of basal bone that may be extensive but follows no predictable pattern.

The maxilla:

10. Procedures that improve prosthesis support include soft tissue corrections, bone grafting and implant techniques. If implants are not to be used, deficient ridges can be corrected at present with the appropriate use of graft materials. Abnormal maxillomandibular relationship may be corrected by maxillary repositioning via an osteotomy along with bone grafting as indicated.

11. With careful patient selection, endosteal implants can be used.

12. In the class IV edentulous maxilla, implants can be combined with augmentation using onlay grafts, inlay grafts of the sinus and/or interpositional bone grafts. In the class V edentulous maxilla, bony augmentation is obligatory when utilising endosteal implants.

The mandible:

13. Procedures that improve prosthesis support include soft tissue corrections, bone grafting and implant techniques.

14. In the anterior class IV mandible, augmentation or reduction of the residual alveolar ridge will be influenced by the clinical requirements. In the anterior class V mandible, implants can usually be placed without the need for adjunctive surgery. In the class VI mandible, adjunctive surgery may be necessary when considering the placement of implants.

15. The patient should be informed that surgical interference with the inferior alveolar nerve may lead to permanent or long-lasting neurosensory disturbances.

General remarks:

16. Osseointegrated implants tend to retard or prevent bone resorption. It is not

yet clear what the effects are of an implant-supported or an implant-mucosa supported prosthesis on the bone in the loaded edentulous area. In any situation the use of implants or any other preprosthetic surgical procedure should not preclude the achievement of acceptable functional and aesthetic results.

17. Some of the above-mentioned procedures are also applicable to the management of both the partially edentulous maxilla and mandible.

18. Endosteal implants, placed in alveolar bone before growth is complete, behave like ankylosed teeth and are not recommended. In patients where no alveolar growth can be expected, implants can be considered. Implants may also be used as a part of orthodontic treatment.

19. It is clear from the current data that osseointegration is impaired in bone that has received doses in excess of 50 Gy. Success rates based on short-term clinical reports are reduced as compared with non-irradiated sites, particularly the orbit. Animal studies indicate that the bone-implant interface may be significantly compromised, making the implant less able to tolerate functional loads. Hyperbaric oxygen (HBO) therapy elevates the oxygen tension in tissues and increases capillary ingrowth, an essential component of the wound healing process. The benefits in irradiated tissues are dependent upon the cellular response of the irradiated cell types and the dosimetry, including the dose level and fractionation schedule. Further research of the effect of hyperbaric oxygen on wound healing is required.

20. Cooperation should exist between the prosthodontist and the surgeon during the diagnostic procedures, be maintained through the various stages of treatment planning and treatment, and prevail through the follow-up care of the patient. Each specialist should be aware of the objectives and possible limitations of the treatment the other can provide, to ensure optimal care for the edentulous patient.

21. *Is there an immediate and/or long-term effect of smoking on the survival of implants?*

Smoking increases the risk of implant failure; implants in the maxilla are at greatest risk. The effect of decreased or

cessation of smoking has not been quantified.

22. *Is the use of chemotherapy a contraindication to the insertion of endosteal implants?*

Does chemotherapy affect the long-term survival of implants?

There is no evidence that individuals who received chemotherapy in the past cannot be treated with endosteal implants, provided their haematological parameters are within normal limits.

- Patients about to undergo chemotherapy treatment should not receive endosteal implants.
- Those patients with functional implants should be treated in a similar way as those with a natural dentition. Any local disease must be treated and controlled. If this is not possible, the implant should be removed or buried.

23. *Does the direction and magnitude of force have an effect on the survival of dental implants?*

Factors that appear to affect the success of implant prostheses are:

- Axial and moment forces
- Occlusion
- Direction, magnitude, timing and duration of force
- Favourable remodelling/modelling capacity of contiguous bone to implant surface

As a result, emphasis should be placed on:

- Optimal position, geometry and number of implants
- Minimising moments wherever possible
- Eliminating excessive axial occlusal loads and occlusal interferences by narrowing buccal-lingual width, mesial-distal length, flattened cuspal inclinations and centering occlusal contacts over the implants.

24. *What are the requirements for the use of implants for the restoration of craniofacial defects?*

Insertion of endosteal implants in the craniofacial skeletal bone is feasible. However, their use in the frontal and zygomatic bones requires further investigation.

- Use of endosteal implants requires thin and immobile adjacent soft tissue
- Remote anchorage methods, i.e. carrier plate, are an alternative

- Implant placement should not interfere with future surgical reconstructive procedures.

25. *Define the roles of vascularised and non-vascularised modes of treatment for reconstruction of the mandible with a continuity defect.*

Selection of bone grafts for reconstruction of the mandible with a continuity defect is influenced by:

- (1) Size/location and complexity of the defect
- (2) Vascularity of the recipient bed
- (3) The effects of radiotherapy
- (4) Requirement for placement of endosteal implants
- (5) Patient age and concurrent diseases.

Free vascularised bone grafts are used for the reconstruction of the mandible with large continuity defects, but they lack precision in that the contour of the mandible is difficult to mimic with these techniques. As a result implant placement is often compromised, giving rise to difficulties when fabricating the prosthetic device. Donor sites include, but are not limited to, radius, scapula, iliac crest and fibula. All these grafts have advantages and disadvantages. Free block grafts and free particulate bone grafts compressed in pre-shaped scaffolds (alloplastic material or properly prepared cadaver bone) may offer an alternative, provided the vascularity and soft tissue environment is favourable. Further research is needed in both areas to determine the best possible solution.

26. *Are implant-stabilised and mucosally-borne prostheses in the mandible as effective in the long-term as implant-supported restorations?*

Prospective studies on the results of mandibular implant-overdenture treatment show similar improvements in patient satisfaction, chewing efficiency and bite force capability when implant-mucosa supported overdentures are compared with implant-supported prostheses.

27. *What material can be recommended for augmentation of the floor of the sinus?*

Data published in refereed journals suggest that autogenous bone is the material of choice for augmentation of the floor of the sinus.

28. *What is the preferred soft tissue grafting material in reconstructive pre-prosthetic surgery?*

When considering vestibuloplasty, keratinised mucosal grafts are to be preferred. When large areas need to be covered, split thickness skin grafts are a good alternative. When considering replacement of peri-implant, diseased tissue, keratinised mucosal grafts are recommended.

29. *Is a keratinised attached mucosa around the implants required to improve implant survival?*

There is no scientific support for the opinion that the presence of keratinised mucosa around the implants is a prerequisite for long-term implant survival. However, the panel recognises that the presence of keratinised mucosa is desirable.

30. *What systemic factors may adversely affect the long-term results of implant integration?*

The scientific literature has addressed a variety of systemic factors that may influence long-term results of implant integration. In general, there is agreement that a compromised medical status does have a negative influence on long-term stability of dental implants. Unstable diabetes mellitus is the only systemic factor that has clinical documentation revealing higher failure rates with dental implants.

31. *What oral habits may adversely affect the long-term results of implant integration?*

There is little evidence that parafunctions (bruxism and clenching) alone adversely affect long-term implant integration.

32. *What is the potential of distraction osteogenesis in reconstructive preprosthetic surgery?*

There is potential for distraction osteogenesis in reconstructive preprosthetic surgery.

33. *How best to restore the partially edentulous jaw with endosteal implants?*

There appear to be several viable treatment alternatives for the partially edentulous jaw. These would include:

- individual endosteal implants supporting individual crowns

- multiple implants supporting a fixed partial denture
- implant-mucosa supported removable partial denture.

Factors to consider are the availability of implant sites and the stability of the implant-abutment connection. Further research needs to be done to determine the advantages and disadvantages of each of these treatment options.

34. *What is the best imaging procedure for evaluation of bone volume and contour in the maxilla and mandible?*

At present, computer tomography (CT) is the gold standard for 3-dimensional imaging of the bones regarding volume and contour in the maxilla and mandible. But for evaluation nowadays the ALARA (as low as radiation achievable) principle should always be taken into consideration.

Reference

1. Report of the International Research Group on Reconstructive Preprosthetic Surgery. The history of the Consensus Conference on Reconstructive Preprosthetic Surgery. *Int J Oral Maxillofac Surg* 1996; **25**: 81-4.